

COAL AGE

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*Devoted to the Operating, Technical and
Business Problems of the
Coal Mining Industry*

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Editor

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Blind Selling

THE gravest problem confronting business at the present time, according to Dr. Julius Klein, director, Bureau of Foreign and Domestic Commerce, is to bring to distribution that efficiency which has made American production methods the wonder of the industrial world. A conservative estimate of the losses now chargeable to inefficient, slipshod, wasteful and unscientific merchandising puts the bill at \$8,000,000,000 per annum—a sum 50 per cent greater than the nation's much discussed export trade. Blind selling, attempts to nationalize distribution at the expense of profits and lack of contact with the ultimate consumer are the major items in this bill of waste.

WHILE Dr. Klein's criticism is directed chiefly toward the distribution of manufactured products, his strictures apply with equal force to the distribution set-up of raw materials. And nowhere, perhaps, is there more pressing need for a scientific study of distribution methods than in bituminous coal. The lure of "a national distribution" has not been strong because transportation charges and coal quality have been barriers which few have been able to hurdle.

BUT blind selling and lack of real understanding of consumer requirements have been as effective allies of waste in coal distribution as in manufactured products. The coal companies which have made detailed analyses of the buying power of specific markets and of the competitive factors entering into those markets have been conspicuous because their number has been so small. These

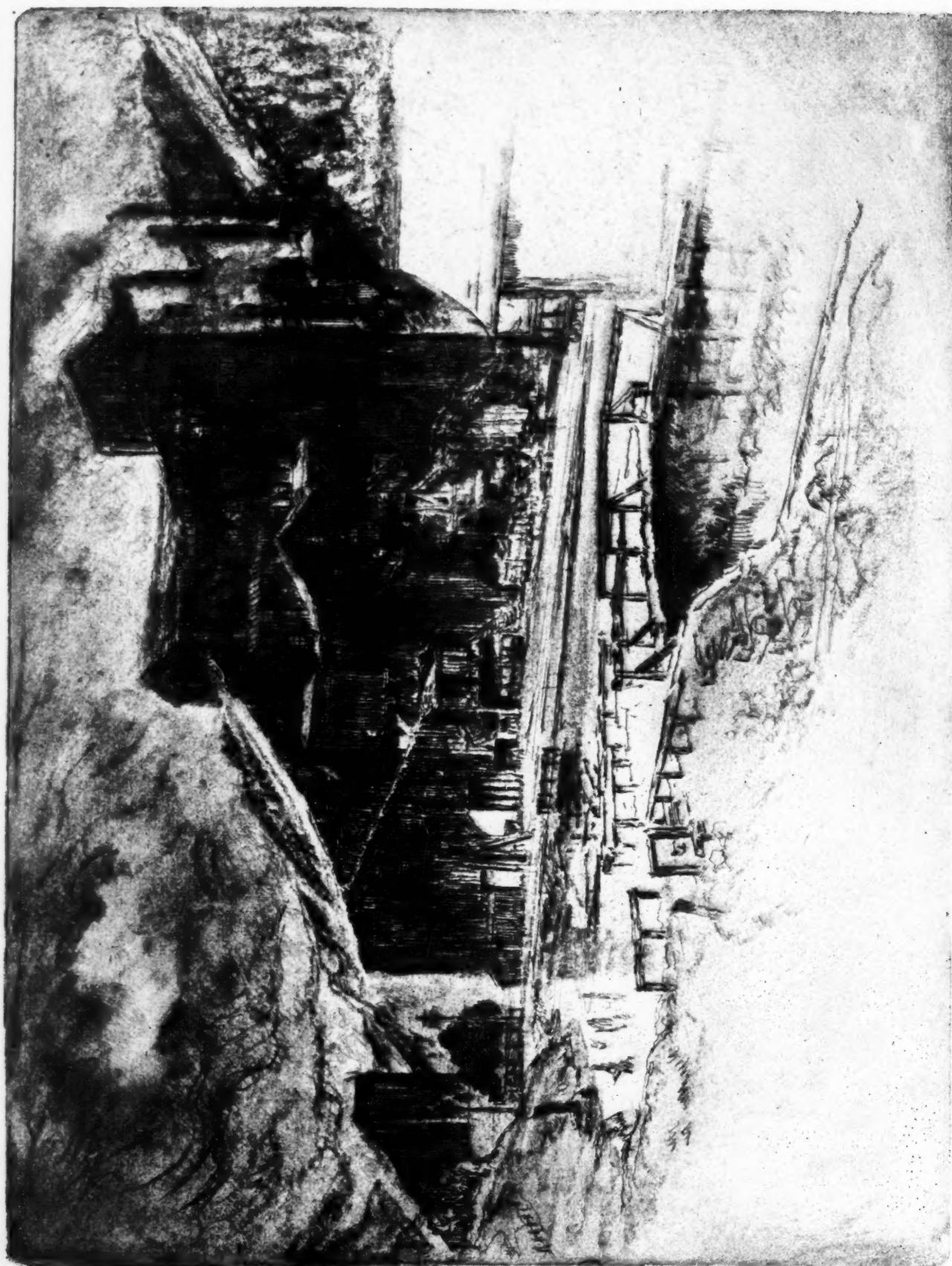
companies have been able to allocate sales costs to individual markets and salesmen with the same efficiency and detail that they have applied to the determination of production costs for individual mines and analyses of individual jobs. What they have done others can do—if the others have the will.

AS a necessary preliminary to such studies, however, it must be recognized that the industry needs more data upon the distribution of its product than now are currently available. Some district and state associations of operators and certain railroad groups have done excellent work in that direction. But more remains to be done to fill out the picture without which intelligent analysis is difficult and selling based upon guess instead of knowledge is encouraged.

WITHOUT a resolute, general attack upon this problem much of the accomplishments in better production methods to which modern industry is definitely committed is wasted. This attack must originate with the top executives. Without scientific selling of coal itself, coal-mine management wantonly robs the improved mechanical processes of the major part of their effectiveness. For what shall it profit an operator to lower production costs through modernization if the sales background is so weak that the improved processes cannot keep him out of the hands of the receiver? The industry is entitled to capitalize upon the engineering and mechanical skill it has developed, but it can do so only through profitable selling.

Courtesy Kennedy & Co., N. Y.

The Crouching Lion
From an Etching by
Joseph Pennell



Is Mechanical Mine a Dream?

One Cutter and One Loader Average 450 Tons a Day

By *Thomas F. Whalen*

*General Superintendent
Pittsburgh & Lake Erie Coal Co.*



MINING MEN everywhere seem convinced that the idea of mechanical mining can be sold to employees only by a slow educational process. This conviction no doubt has deterred many from making efforts to mechanize their mines.

My experience, in so far as it has extended, has shown that employees will be as responsive as the equipment they are operating to the opportunities that are afforded them; consequently, if the equipment is positive, powerful and rapid and the duties of employees and the method of mining well defined, the whole operation becomes simple and surprisingly agreeable to management and employees alike.

Coal mines can be just as readily mechanized as other fields of endeavor, but it would seem that owing to the operations being conducted underground in dark and cavernous passages more or less of mystery beclouds the situation. For this reason we do not have a co-ordinated view of the problem of mechanization but suffer from what may be termed a mystery complex. This attitude of mind has cost the industry immense sums of money and yet has resulted in many mechanization failures.

Starting out with such an admitted handicap, the writer spent much time and travel in an endeavor to develop an unclouded view of the application of equipment to mechanical mining, and a portrayal of the results of that

Fate frequently plays strange pranks with men's careers. Although he left school at 13 years of age to work in a coal mine in Ohio Mr. Whalen continued to study. His father, also a miner, excelled as a penman. The boy sought to excel him.

One day when the weighmaster at the mine failed to report for duty young Whalen was called out of the mine to record the weights. The legibility of the weigh sheets and their accuracy at the end of the day impressed the superintendent. In a short time he was transferred to the mine office. From miner to mine clerk, auditor, superintendent and general superintendent represent definite steps in his progress, inspired frequently by a growing family for whom he sought educational opportunities beyond those he had enjoyed.

Never satisfied with anything less than first-class accomplishment for himself or his associates, he has consistently striven for better methods of mining. This has led to an intensive study of mechanization and several years of experimental work. "Such success as I have had with mechanical loading," says Mr. Whalen, "is due to the encouragement and patience of G. B. Taylor, president of our company, and a firm conviction that we were on the right track with the equipment we are using."

endeavor is the object of this story. As a result of observation and preliminary study the conviction was early gained that a flexible coal-cutting machine was one of the first essentials to a successful mechanical-mining installation. The Oldroyd Universal coal-cutting machine therefore was chosen to supply this essential. Fig. 1 shows this machine in a bottom cutting; Fig. 2 in shearing position; Fig. 3 in top-cutting position.

This machine will cut at any location in the coal seam from the floor to the roof of the mine and will shear in any location in the seam within 5 ft. in either direction from the center of the track. Experience has taught that a flexible coal-cutting machine of this kind is an incalculable aid to a coal-loading machine in that the coal can be prepared with a minimum of breakage and in a mass which materially reduces the effort, and greatly increases the capacity, of a coal-loading machine.

The next and all-important essential to successful mechanical mining, as was discovered in attempting mechanical loading with one of several coal loaders available at the time, is that a coal-loading machine to be successful and profitable in operation must be flexible, powerful, rapid and durable, no matter what its weight may have to be to provide these qualities. With this conviction firmly fixed a canvass was made of loading machines then to be had embodying these essentials, with

the result that the Oldroyd machine was installed, the first machine of this particular type constructed. In fact, the order for this machine was given because it was seen from a small model that the principle advanced was correct.

Fig. 1 shows this machine as it is today with the exception that it has been strengthened here and there. The whole principle, however, remains the same. It is loading on an average approximately 450 tons per day for 25 days per month with 70 per cent of its operation in entry or development work.

THE kind of mining method used is as important as the kind of coal-cutting and coal-loading machine. Experience has taught also that the room-and-pillar plan insures the maximum production over a given period and also that with it the hazard is less than with longwall of any kind in seams $5\frac{1}{2}$ ft. thick and over.

The mine in which this equipment is being operated is known as Sumner No. 3. It is owned by the Pittsburgh & Erie Coal Co. and is located near Brownsville, Pa. It was opened up but recently and is being developed on a three-entry system including main butts and faces, of which there are now three of the former and six of the latter.

The butt entries are turned off on 500-ft. centers which provide rooms 500 ft. deep. The rooms are driven 20 ft. wide on 40-ft. centers, leaving a room rib 20 ft. wide. These ribs will be brought back retreating with the loading machine immediately after the room is driven up, the usual roof break line being maintained. Cross-cuts in both entries and rooms are driven at distances of 100 ft., in accordance with the Pennsylvania mining laws. With butt entries on 500-ft. centers less than one cut per day out of butt entries will keep

development for one loading machine open.

The equipment operates on 30-lb. rails. In the room turnouts No. 2 $\frac{1}{4}$ frog is used, which gives a curve of 32-ft. radius on which the loading

In spite of what is commonly said about the efficiency of large units in industry, there is ample evidence that size is not by any means the most important factor. In this issue of "Coal Age" may be found examples of small mines as far apart as Illinois, Arkansas and Pennsylvania that have taken time by the forelock and gone in strongly for mechanization. No two of them use exactly the same equipment; no two use precisely the same methods.

If every institution is the shadow of a man, it may be said with equal truth that each outstanding accomplishment in mechanization represents years of persistent effort on the part of some man connected with the company whose personality spells "stick-to-it." Neither discouragement nor temporary defeat turns such men from their purpose.

Genuine progress is measured best by the achievements of leaders. On this basis there is much food for thought in the several splendid articles on mechanization found throughout these pages.

machine may be operated with fair rapidity. The rails for rooms and temporary tracks are cut to 8 $\frac{1}{2}$ -ft. lengths and punched for splice bars, which are cut in half, and only two

Figs. 1 and 2—Cutter Lowered for Bottom Cut and Turned for Shearing

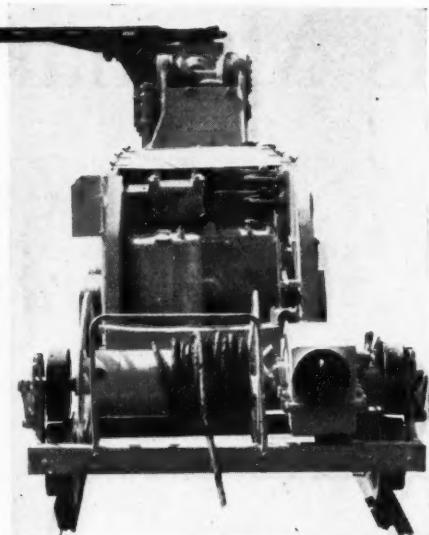
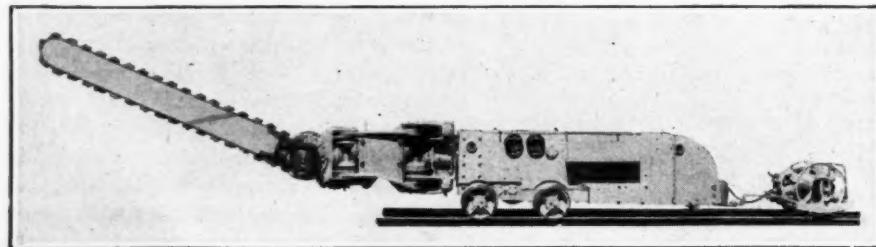
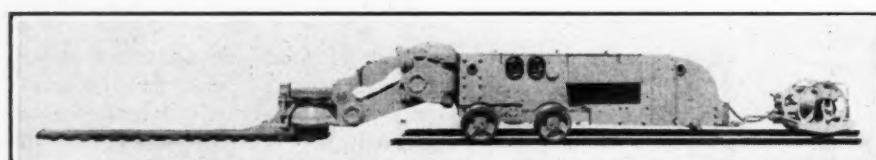


Fig. 3—Same Cutter Raised to Cut Near Roof

bolts per rail joint are used. The rail and splice bars as above described are furnished in these lengths by the mill from which they are purchased, therefore none of this work is done at the mine. Wooden mine ties are used measuring 3x5x5 $\frac{1}{2}$ in. On an even floor or bottom, steel ties may be used.

Such a track has been found well suited to the operation of the equipment even though the loading machine weighs approximately 22 tons; its weight, it will be noted, is distributed over eight wheels, with the result that it does not overload the track nor is it subject to derailment.

Operations are being conducted in the Pittsburgh seam, which has an average thickness of 7 ft. and a characteristic draw slate which is approximately 12 in. thick. This falls of its own weight or must be taken down for safety. Its disposal always is a matter of concern. At this mine it is taken to the surface and dumped, but as the space for wasting or dumping slate at the mouth of the mine is quite limited every effort has been made from the beginning of operations to get through the hill to a more spacious dumping ground. Under these circumstances more development work has been done than usually would be necessary. This has adversely affected production, for the loading machine has had to make as many as sixteen moves per day, long and short, for an average of 450 tons and 100 ft. of development of narrow work per day. Where the mining and loading were confined to rooms the maximum production in the regulation eight hours was 565 tons. This was loaded and transported in 151 mine cars.



The single mechanical unit at this mine consists of an Oldroyd coal-loading machine, an Oldroyd coal-cutting machine, two Ironton Engine Co. storage-battery locomotives and 38 Sanford-Day 3½-ton drop-bottom mine cars of which only 20, however, are used with this unit. No necessity has been felt for auxiliary equipment to take the coal away from the loading machine and will not be, for any loader which can load a 3½-ton mine car in one minute and often less compensates in full for loss in hauling time.

In drilling the face two Chicago Pneumatic Co. electric drills are used. In the entry two holes are drilled, one on each side of the shear cut about a foot from the rib. In the rooms four holes are drilled, one near each rib and one midway between each rib and the shear cut. These latter are snubbing shots to cause the coal to roll over when the rib shots are fired. Pellet powder is used to bring down the coal, 1½ sticks being used in the rib and one stick on the intermediate shots. Both

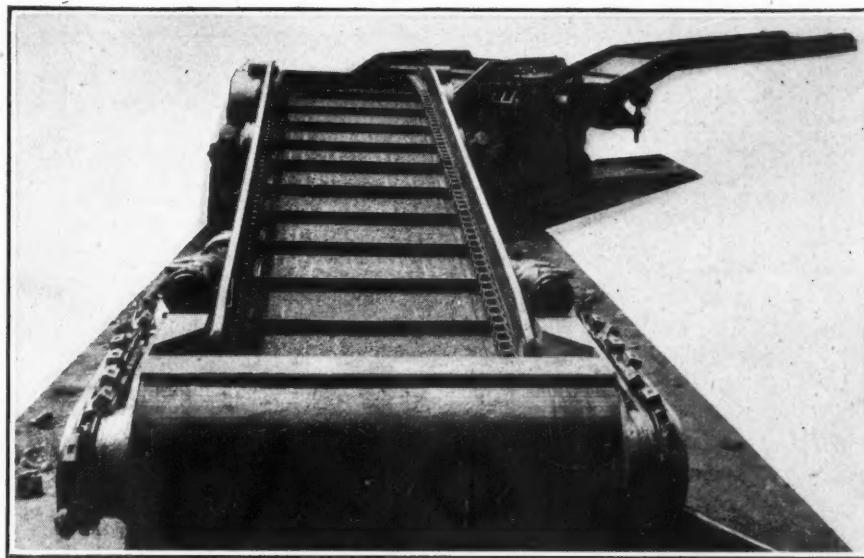


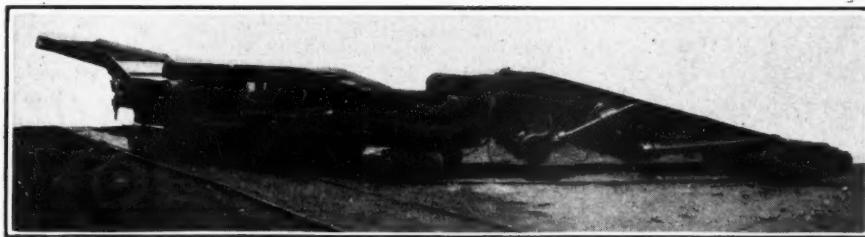
Fig. 5—Same Loader Showing Gathering Element

whole force, is 15 tons per day with a corresponding reduction in cost.

When two additional units of this equipment have been installed the production per man employed will be further increased because a plant de-

signed for 1,500 to 2,000 tons per day gains in efficiency by the addition of units. Many of the men cannot be kept continuously employed when only one unit is in operation, though, of course, they have to be paid for full time.

The loading machine has two operatives, but it is necessary, of course, to have a locomotive pushing the car back and forth as it is being loaded. Consequently each machine has two motormen serving the loader. The cutting machine is run by two men. One cutting machine will suffice for one loader, though there are actually two at the mine. Should the cutter be required to drill the boreholes the cutting machine would be unable to meet the capacity of the loader. On April 23 the machine filled 166 mine cars containing an aggregate of 619 tons, obtaining the coal in seventeen separate places. There are 30 men in all below ground.



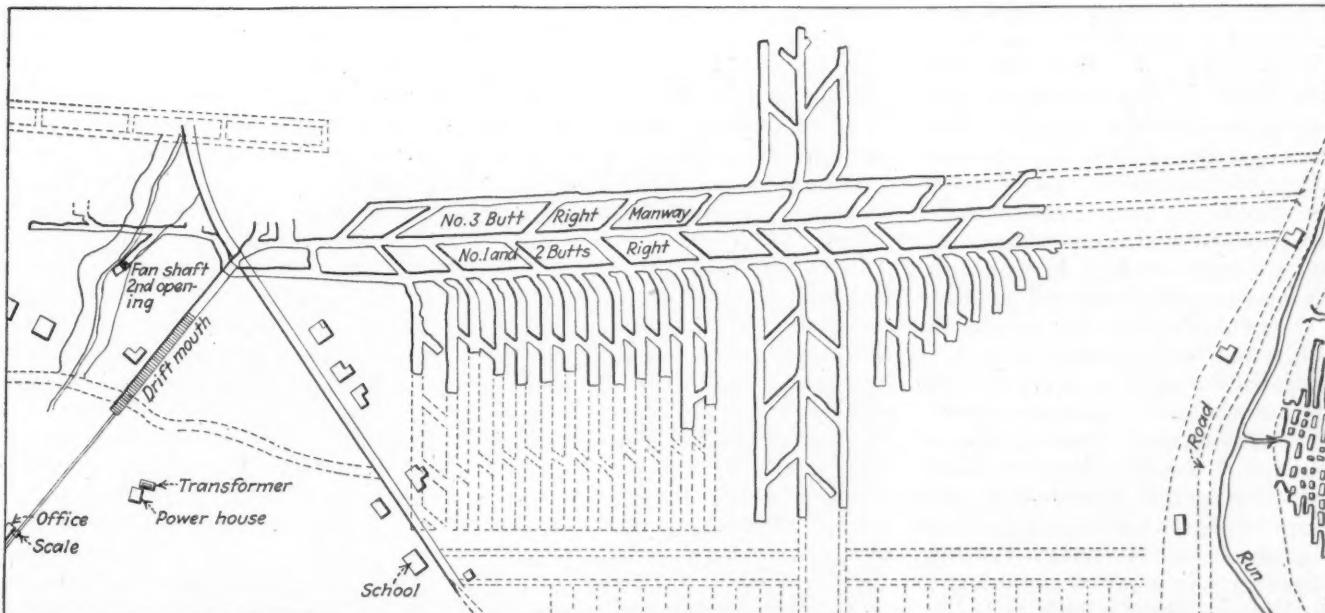
the shearing and the undercut are 9 ft. deep. The holes are only 8 ft. 6 in. long.

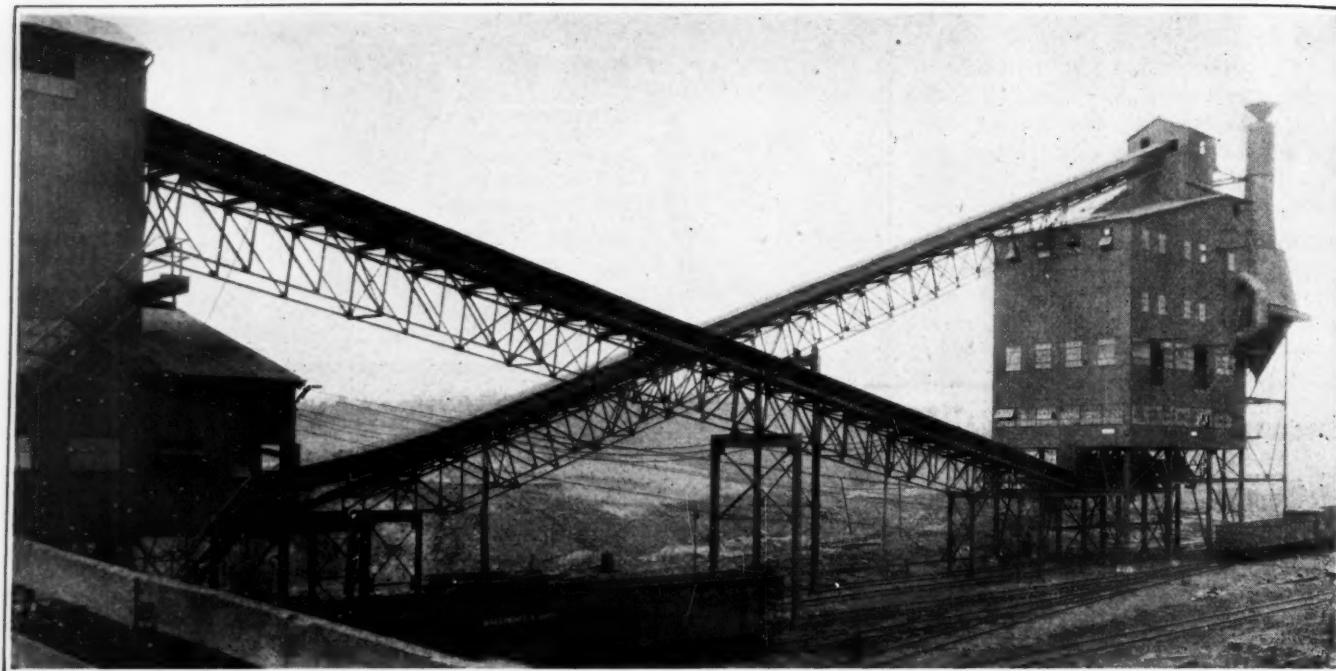
The production per man employed inside and outside, which includes the

Fig. 4—Side View of Machine Loader on Sharp Curve

* * *

Fig. 6—Sumner No. 3 Mine Has Nothing but Narrow Work





Air Coal-Cleaning Plant at Boswell

AIR CLEANING PLANT

Embodies Some

By W. H. Naylor and A. F. Brosky

Vice-President, Davis Coal & Coke Co.

Associate Editor, Coal Age

A PROCESS of cleaning coal by air which embodies a number of features not hitherto put to practical use is being utilized at a plant recently installed by the Davis Coal & Coke Co. This, the first plant based on this process, at the Orenda mine of the company, Boswell, Somerset County, Pa., has been in successful operation for a period of nine months. It has a capacity of 250 tons per hour and reduces the ash 3 per cent and sulphur $1\frac{1}{4}$ per cent. The process was developed by Heyl & Patterson, Inc., of Pittsburgh, Pa.

Believing the pneumatic process is best for the cleaning of small coal, the company chose this system in preference to any of those requiring the use of water. Another deciding factor was that the coal as mined is quite dry, in which state it is most amenable to treatment by air. Block and egg, which are the larger sizes produced, may be picked economically by hand.

As shown above, the cleaning plant is located directly on the line of the railroad tracks serving the tipple. This arrangement was made to allow the direct loading into railroad cars of individual cleaned sizes, or combinations thereof, simultaneously with the loading of the larger sizes from the tipple. Any or all of the cleaned product may be carried back to the tipple and combined with the hand-picked coal.

It will be noted, furthermore, that the distance from the tipple is quite great. In making this arrangement it was decided to use belt conveyors for transporting coal from one structure to the other, at the same time avoiding interference of railroad cars being loaded under the tipple with those being loaded under the cleaning plant.

The cleaning plant is of duplicate or twin construction, the equipment in one-half of the building being similar to that in the other half

except for such minor differences as are required by reason of the inequality of the products as to quantity treated. The plant consists of three floors: On the uppermost floor are the screens; on the middle floor are the tables and on the lower floor are the blower and exhaust fans and supplementary equipment.

A 24-in. belt conveyor carries all minus 2-in. coal from the shaker screens in the tipple and elevates it vertically approximately 100 ft. above the tracks under the cleaning plant. From the discharge end of this incoming conveyor the coal moves continuously downward in its passage through the cleaning plant. The advantage of height is gained at the outset and the coal is now lowered only to be raised again by bucket elevators for each succeeding step in the cleaning cycle. The only departure from this general design relates to the lifting of middlings directly back to

the tables through the agency of small bucket elevators. This is the only instance in which belt conveyors or gravity are not utilized as the transporting media.

From the incoming conveyor the coal is discharged into a 25-ton hopper from which it is equally divided by two feeders between two duplicate banks of "Jounger" single-decked screens—pictured below. Each bank comprises six screens, each independently mounted but all driven as a unit.

The screen mountings or supports are single-leaf springs set at an angle with respect to either the floor or the screen itself and firmly fastened to each. They are thus arranged in a manner similar to that of the Parrish drive used in anthracite screening except that they act as supports rather than as suspensions. Six of these springs are used for each screen, one at each end and one in the middle of each side. They are made of automobile-spring steel and transmit the drive motion to the screen without vibration to the building.

All six screens in a bank are driven from a single longitudinal

To CLEAN or not to clean mechanically is a problem that each coal operator must face for himself. The final answer, of course, must be based on net realization. A better price, wider markets for large sizes and readier sale for fines all influence decision. The method, too, must be suited to the specific conditions, the requirements of the operator and the influence on the sales department.

The lifting and lowering of the coal bed with respect to the screen does not strictly conform with the frequency of the strokes. The motion is more the resultant of a number of strokes and is best described as being similar to the bounding leap of a rabbit. This motion agitates the coal so thoroughly that "massing" is impossible and screening at every moment is uniformly effective.

All screen frames are of the same size, each being 4 ft. wide and 8 ft. long. In each bank the area of $3\frac{1}{2}$ screens is covered with $\frac{1}{2}$ -in. mesh, that of 2 screens with $\frac{1}{4}$ -in. mesh,

any tendency of the smaller openings to become blinded. The products of screening as to size in inches are: Minus 2 to plus 1, minus 1 to plus $\frac{1}{2}$, minus $\frac{1}{2}$ to $\frac{1}{4}$, minus $\frac{1}{4}$ to plus $\frac{1}{8}$ and minus $\frac{1}{8}$ to 0.

These screens are at all times accessible for repairs and open to view as the necessity for hooding them has been avoided by the use of a suction dust-collecting system. So effective is this system that one may discern all details in the darkest shadows of the room while the screens are in operation. A faint haze over each screen is perceptible, but this does not extend high above or beyond the sides of the screens. The dust which tends to rise as a result of screening is drawn by suction into slot ducts, two of which are located on each side of each screen.

UNDER each screen is a small receiving hopper into which falls the undersize coal. These are likewise provided with suction ducts for the extraction of dust. These ducts are baffled so as to prevent the removal of coal of appreciable size with the dust. An individual dust-collecting system is provided for each battery of screens and the battery of tables under them. In addition to serving these primary purposes these suction units also remove dust from and above the collecting belt conveyors under the tables, these conveyors being hooded for the accomplishment of this purpose.

The exhaust fan for each suction unit is driven by a 100-hp. motor and discharges into a cyclone collector. These collectors are unusually large, the purpose being to allow a greater expansion of the incoming air than is customary and thereby to lower the pressure to the point where only the most impalpable dust is emitted from the stock. All of the dust blown into the atmosphere, of which the quantity is small, would pass through a 300-mesh. As the discharge of the stack is 160 ft. above the ground this extremely fine dust travels a long distance before settling and consequently is widely disseminated.

From the small collecting hoppers under the screens the sized coal passes into storage bins of sufficient size to provide continuous feeding to the tables. Altogether there are 10 tables—1 table handles the minus 2 to 1; 1 table handles the minus 1 to plus $\frac{1}{2}$; 1 table handles the minus $\frac{1}{2}$ to plus $\frac{1}{4}$; 2 tables handle the minus $\frac{1}{4}$ to plus $\frac{1}{8}$ and 5 tables handle the minus $\frac{1}{8}$ to 0.

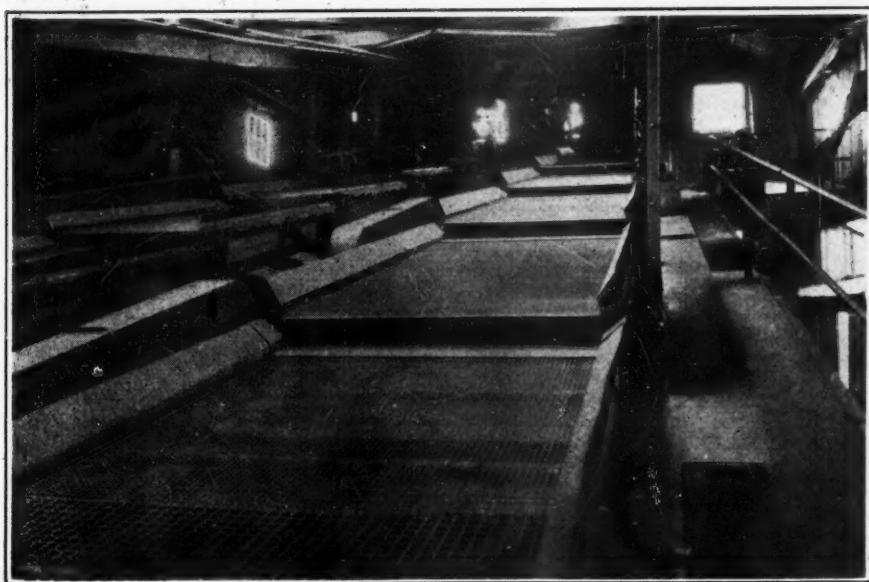
The tables, shown on page 272, are

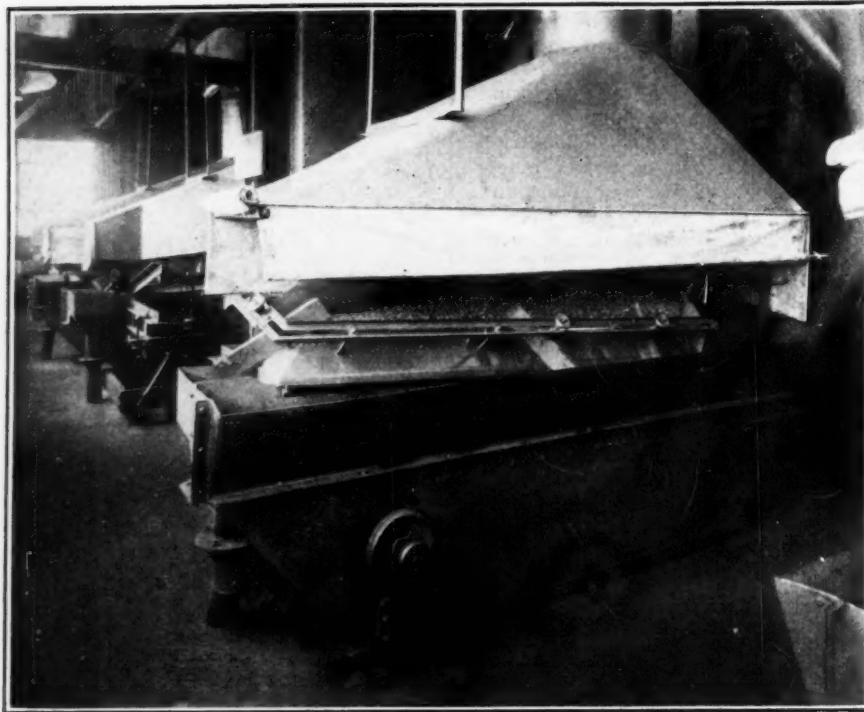
Unusual Features

shaft by a 20-hp. motor. Motion is transmitted by bevel gears from the master shaft to cross shafts—one for each screen—one each of which is an eccentric. The screens are inclined at an angle of 10 deg. and make 350 strokes a minute.

that of 1 screen with $\frac{1}{2}$ -in. mesh and that of $\frac{1}{2}$ screen with 1-in. mesh. The screen openings are so arranged as to cause the removal of the smallest size first and the largest last. The passage of the largest sizes over the smaller openings is said to eliminate

Like the Leap of a Jack Rabbit Is the Motion of These Screens





These Tables Have a Wide Range of Adjustment

of the single-unit type, which gives a wide angular adjustment in any plane. A feature in the operation of these tables is the arrangement by which the middlings are lifted directly from a hutch and redeposited upon the table from which they were rejected. This continuous circuit of the middlings assists in maintaining a uniform bed on each table and avoids needless burdening of the screens which occurs when the middlings are deposited on the raw coal conveyor.

Another feature is that considerably more air is exhausted above the tables than is forced through them, with the result that an appreciable quantity of air is drawn from the room and the escape of dust thus prevented. Each table is supplied with air by an independent fan driven by a motor of 10 to 30 hp. and also is independently driven by a 5-hp. motor which at the same time drives the feeder and the middlings elevator.

Each table is independently controlled by a push button conveniently located. A dual master-control system also is provided for the entire plant, one master control being located at each end of the room.

An important feature in the design of this plant is the care exercised in sealing each floor from those below it. The floors are constructed tight of poured concrete. The stairways are outside the walls of the building. All chutes from one floor to another are solid and the joints electrically welded.

The reason for this care obviously is to prevent the filtering of dust from one floor to another. Particularly is this important with regard to the floor on which the tables are located. Should any appreciable quantity of dust trickle through this floor, it would be gathered up by the force fans on the floor below and be impelled against the small openings in the table bed and thereby obstruct

the air passage through the tables.

Tapered roller bearings are installed for every purpose practicable in this plant. The belt conveyor pulleys run on them; they are used on the screen and also the table drives.

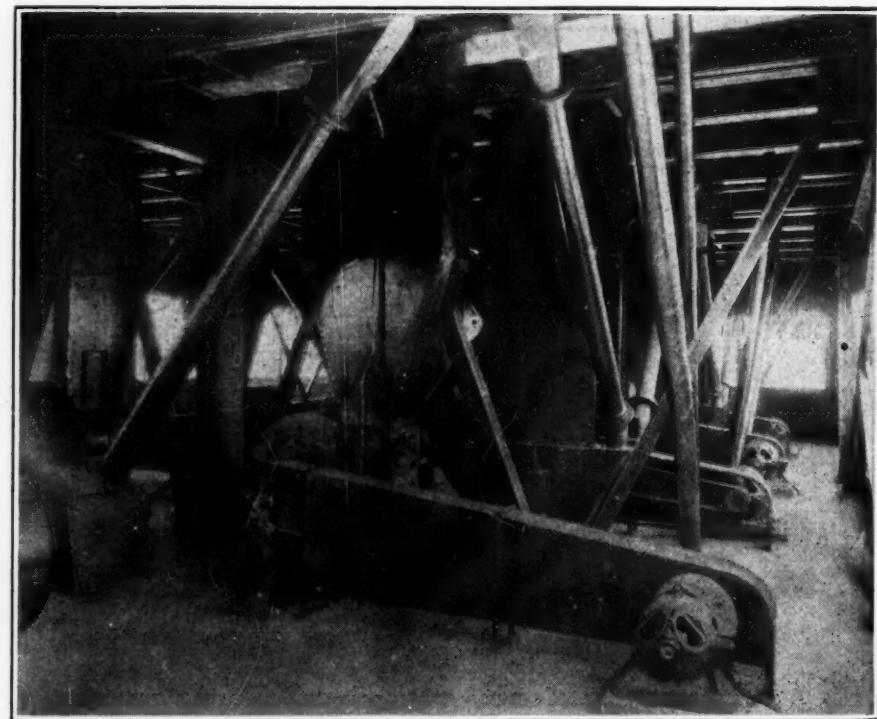
The operating crew consists of three men: an attendant on the table floor and the fan floor; one man handling cars under the cleaner and an electrician who looks after the maintenance work. This last man, however, divides his time between the cleaning plant and the tipple.

An average of 5 per cent of the coal input to the plant is rejected as refuse. This refuse analyzes 50 per cent ash and 15 per cent sulphur.

Treatment of coal in this plant, the Davis company believes, yields a uniform product, thus enabling the company to make certain guarantees which could not be made with confidence by producers lacking mechanical cleaning plants. At the same time it is possible to meet the requirements of practically any plant consuming low-volatile coal. For instance, the fine coal—0 to $\frac{1}{8}$ in.—from this plant is well adapted for use in pulverized-coal units, obviating the time and expense of crushing besides being low in ash, high in B.t.u. and uniform in quality.

The plant also is equipped to load 2x4-in. egg and 4-in. lump which is both shaker- and lip-screened and loaded in railroad cars over a loading boom of medium size.

An Individual Blower for Each Table



MAN POWER

Adjustments of the Individual Worker

By H. S. Gilbertson

Director of Personnel
Lehigh Coal & Navigation Co.



MANAGEMENT, as distinguished from shrewdly seizing hold of natural competitive advantages, is primarily a matter of giving the closest attention to details. In coal production there is no more important detail than the individual worker. If there is a major, characteristic fault of the industry in the handling of the individual worker it is not that this or that modern system or theory of handling men has not been adopted but that the whole matter has been allowed to drift, that the individual workers have been left so completely to make their own personal adjustments.

Probably this procedure was perfectly natural in the earlier stages of the industry. Mining began as a practical art in which one man's claim to mastery was as good as another's; everyone learned through experience. Consequently, the miner conceived a profound conviction of his superiority and supremacy in his own rather limited domain—the craving to be superior in some one relation of life is deep-rooted in all of us. In the case of many miners this sense of superiority was amply justified. They probably did know in many cases as much as, or even more than, their foreman, and unquestionably more than superintendents, engineers, managers and miners about their particular side of the work. There also was not the same urgent need in the mines as in factories for the individual to subordinate himself to authority.

BUT machine mining makes a vast difference. Processes are changing; new systems of development and working; new subdivisions of labor. Mining is becoming a matter of team work in which the individual must adapt himself to the needs of an organization. He cannot mine when and how he likes. He must produce against the capacity of the undercutting and loading machines or conveyors. These fundamental changes, coming gradually and perhaps without

full appreciation of their meaning on the part of the men who are nearest to them, are destined to demand either a new set of miners or else a pretty thorough reconstruction of the habits and thoughts of the old timers, or a little of both.

It is easier to sketch the general situation than to point out the most feasible methods and technique of meeting it. However, the whole matter may be summed up by saying that if the individual worker is to be adjusted and reconciled to the industry's needs, we must help him to see himself in all of his relationships to the industry. He must be technically adjusted to his specific work. He must be capable of fitting into the particular organization of which he is a member. He must be in harmony with the general industrial situation.

A few simple illustrations will suggest some of the directions in which care and study seem to be called for in fitting a miner to his job:

A contractor, driving rock tunnels in certain mines, had a way of hiring undersized waiters from a metropolitan district, who had never seen a mine, to do "mucking." Some of them turned up for work in the sawed-off dinner coats of their profession. Very few of them made good. Some serious accidents were occasioned by their presence in the

mines and their incapacity for taking care of themselves.

Certain foremen of the writer's acquaintance have a rather fixed rule that gangway timbermen must always be of the big and husky type, whereas another set of foremen assert that they get the best results from smaller and more agile men. Surely both cannot be right, and the presumption is that one or the other have misinterpreted their own experience or failed to recognize the possibilities of certain men.

A foreman made a requisition for a laborer, but when a certain worker showed up on the job he refused to accept the applicant and discovered that he needed nobody for the work. This same worker, though slow in his motions, as the first foreman had complained, turned out to be most faithful, thorough and systematic, and accomplished more in a day than most of his superficially active fellows.

WHERE expensive equipment is involved or there is necessity for the most careful precaution, as in the case of hoisting engineers, it seems to be the universal rule to select with the utmost deliberation. And yet, in a lesser degree, every employee in the mines is a potential safety risk to himself or others.

How many mines require a medical examination as a requisite for employment? Where the practice is in vogue it has prevented many a misfit and avoided many an injury.

How many mines have a service record by means of which they may check up the applicant's experience? Or is it the practice to take his undocumented word for it?

Is favoritism practiced in the selection of men, or is this just something that disappointed miners like to talk about?

But the neglect does not stop at the original selection of men. Good human energy undoubtedly is going to waste in the industry for lack of proper instruction and training. In large parts of the bituminous fields

there is a perennial complaint of excess screenings and deficiency of lump coal due to improper placing of shots and improper charging, and yet comparatively little seems to have been done to standardize methods in the use of explosives and to insist upon their use by the miners.

There are difficulties in the way, no doubt, the chief of which is the miner's own attitude of self-sufficiency and reliance upon the authority of hand-me-down information. And yet large companies have made some rather exhaustive researches into the best methods of firing, which have resulted in increased earnings for the men, increase in the larger sizes and a decrease in production cost. The problem is not of the technical one of finding the best firing methods—the powder companies seem eager to render assistance—but of getting the men to accept them.

ANOTHER set of the individual worker's relations—that is, with his immediate fellow workers and supervisors—was dealt with to some degree in the previous article. A word remains to be said, however, of the methods to be employed in creating that vague and much-longed-for quality of "co-operation," which is more preached about than practiced.

To begin with, it looks as if the first move in nearly all cases is up to the management itself, and probably the first, second and third moves. If individual workers are thinking beings, and if they are to keep on thinking straight, it is as important to keep them supplied with food for correct thinking as to keep them on the job by putting money in their pay envelopes. Food for thought means vital facts about the business.

Take the matter of mining costs: No one who has not had occasion to analyze the matter has any conception of the multitude of items which go to make the total. If, for instance, the veins in a mine are very irregular, a miner who may be working in a particularly favorable section is likely to compare his return in wages with the market price and draw strange conclusions as to the company's profits. He takes no account of other sections which may be mined at a loss, of costly development work, of sections closed off on account of mine fires, of depletion or royalties, of local and federal taxation and of mine idleness.

Why not tell him about these things, a little at a time, in simple

language, as favorable opportunities arise? If you do not tell him, someone else will, and the chances are all against that someone telling the matter straight, for the simple reason that such an informer usually will not know what he is talking about.

Doubtless it is true that publicity for some matters, under some circumstances, is unwise. But a consistent policy of secretiveness, by and large, is positively dangerous. This for the simple reason that the worker habitually resolves against the employer the doubts created by his reticence. Silence on profits, for instance, is more than likely to create a mistaken impression of swollen profits, which any amount of mere protestation will not dispel.

Again, the individual miner is an inhabitant of the most turbulent quarter of the economic world. That this world is, as yet, so completely beyond his comprehension is amply demonstrated by the facility with which he becomes a party to courses of action which redound to his own destruction. For instance, the major difficulty with the bituminous industry, by universal consent, is overdevelopment. For this condition a number of causes were contributory, but, in the language of the United States Coal Commission:

Among the more important causes of these factors contributory to overdevelopment prior to 1916, even beyond peak demand, were periodic strikes in the organized fields. The most important and regular were those in the Central Competitive Field. Beginning April 1, every second year, these strikes came with such regularity that their effect was anticipated. Consumers, particularly the railroads, bought heavily in advance and stored coal to tide them over the strike. This meant a season of very active demand which encouraged the development of new mines. In years when these strikes were of more than usual severity the non-union fields were called in to meet added demand for coal; thus overdevelopment was promoted.

Thus has the miner completely missed the significance of the law of supply and demand in his own economic relationships.

It sometimes looks as if we were so accustomed to mass movements in the industry that we have forgotten that it is composed of individuals. In the periodical conferences between operators and the miners' representatives which determine the destinies of a large part of the industry the "cards," presumably, are "laid on the table," but are the facts relayed to the individual workers? A remark of one of the outstanding leaders of the United Mine Workers organization may throw some light on what

actually has been known to happen:

"I know that the operators in the State of — are up against it, but if I should tell that to the workers they would think I had gone over to the other side."

The ways of the individual miner and of the mass often seem past finding out. Like the rest of us, they do not go about revealing their innermost selves. It takes a vast amount of digging to discover the real man.

THE trite old saying that "human nature is the same everywhere" contains a lot of truth. It is not to be expected or desired that the miner should give up his hopes for a better life through a better pay envelop, but it is often true that wage demands, whether general, local or individual, have a much deeper root in him than a desire for "more money." Probably even the worker himself does not know it, but such demands often constitute that definite something which expresses a sense of injured dignity or a positive desire to move toward a superior place in the social scale. This, without doubt, was the case with a certain breaker employee who had been put on a very slightly decreased scale of wages due to a change in the number of machines he was obliged to tend. He insisted on his case being discussed at length by the mine committee, the superintendent and the management, and upon a review by the Board of Conciliation and a written decision by the umpire. A favorable settlement would have netted this worker about \$8 more pay in a year, but what really mattered was that it would have raised him above the common labor rate.

Coal mining is one of the dirtiest and one of the most hazardous occupations in the world. But these features do not repel men from entering or remaining in it, and when, for some temporary reason, they leave for some other branch of industry, they usually drift back. For mining holds certain satisfactions and fascinations; if advantage is taken of them there does not appear to be any insurmountable reason why it should not be an industry of permanent peace and contentment.

What all of us do not know about people, including ourselves, and "why we behave like human beings" would fill the Congressional Library. But every addition to our knowledge, from whatever source derived, will help solve some of the major problems of the industry.

300 TONS DAILY

Loaded by Each Machine Crew

By J. H. Edwards

Associate Editor, Coal Age

DR. FYKE is setting the pace for mechanical loading in Illinois," was the comment of a prominent Illinois operator when the mine at Centralia was mentioned. The pace to which he referred is an average output, for both room and entry work, of over 300 tons per loader per 8-hour shift using Joy loading machines.

Dr. E. E. Fyke, residing at Centralia, is president and manager of the Marion County Coal Co. For some years he was a practicing physician, but after acquiring a financial interest in the coal industry he left the medical profession for the operation of mines and took a correspondence course in mining engineering.

The Marion County mine was about 20 years old when Dr. Fyke



Superintendent Answers Questions as Indiana Visitors Leave

Left to right: John Stedelin, S. Zeller, vice-president, Knox Consolidated Coal Co.; H. G. Conrad, superintendent, same company; O. A. Gottschalk, Joy Machine Co.; and H. A. Glover, vice-president, Knox company.

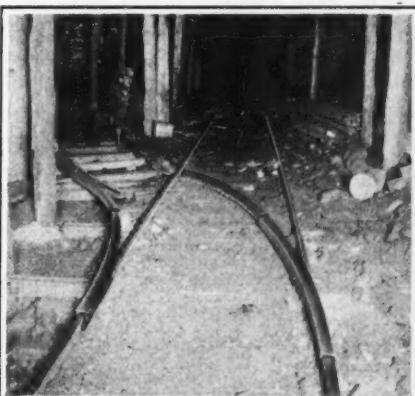
here runs from 6 to 7 ft. in thickness, lies nearly level and contains the characteristic "blue band" which is a parting of shale carrying pyrites. It occurs about 14 in. from the bottom. Close above the coal is a 16- to 18-ft. stratum of tough limestone. This is so strong that only infrequent breaks can be obtained. Consequently, the drawing of pillars is believed to be impracticable. Between the coal and the limestone is a layer of slate that ranges from 0 to 3 ft. and in some places a drawslate is found which comes down as the coal is shot. This runs from 0 to 3 in.

In April, 1925, experiments were made with mechanical loading. The first installation consisted of portable mine-car loading conveyors onto which the coal had to be shoveled by hand. In July, 1926, the first Joy loading machine was installed. The loading equipment now consists of seven Joy improved type 5 B.U. loaders.

Dr. Fyke states that he does not regret the installation of conveyor

loaders, for his experience with them led to immediate success with the Joy machines. In his own words: "Our early conclusions were that the loader must be given every possible advantage. The coal must be shot down entirely free from the face. To assure this, snubbing is necessary. The track equipment and arrangement must be such as to cut the car-changing delays to a minimum. We were convinced that the oft-quoted statement to the effect that mechanical loading is 90 per cent management and 10 per cent equipment was fully justified. So we went at the job with that idea in mind."

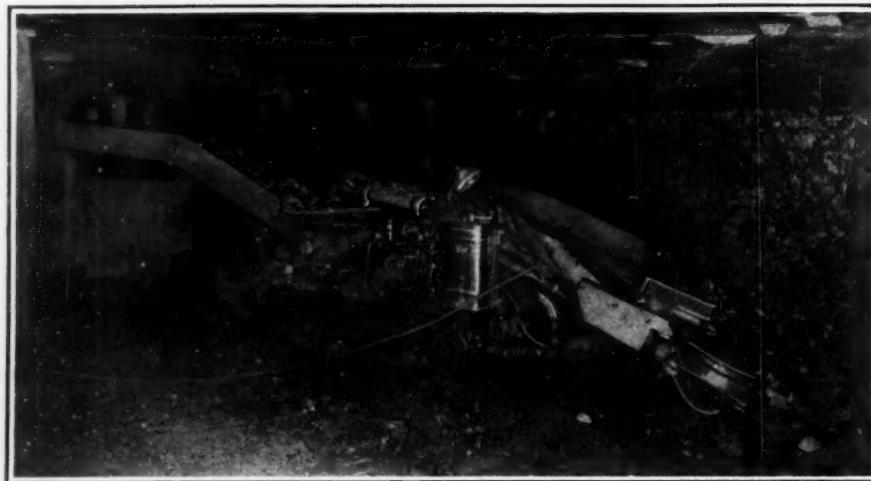
To promote rapid car changing,
Laying the Portable Side Track in an Entry



New Steel Car Having Low End for Loader Boom. At the Right, H. W. Parkinson, Top Foreman

decided to introduce mechanical loading. Since he made the change he has spent approximately \$250,000 on underground equipment. In the face of the uncertainties of the last few years it took no little nerve to put this additional investment in an old mine. Yet results to date indicate the wisdom of his decision.

The mine is in No. 6 bed which



Joy Loader in 30-Ft. Room

John W. Stedelin, superintendent, devised a portable turnout which can be inserted without cutting the rails. To date the company has purchased 41 of these complete portable passing side tracks of one-car capacity. They were made by the West Virginia Rail Co. in accordance with Mr. Stedelin's suggestion. These portable side tracks and the snubbing of the coal have together made it possible to average more than 300 tons per loader.

The panel system of mining is not employed, for the mine generates no appreciable quantity of explosive gas. The rooms are driven 30 ft. wide and 300 ft. long on 60-ft. centers. Until recently room entries were driven in pairs but, now that Joy loaders are used for entry driving, the three-entry system has been adopted.

The territory for each loading unit consists of six rooms on each side, the three entries and all crosscuts. By driving the entries every other day with the aid of the loading machine sufficient development is maintained.

The operating cycle is as follows: First the coal is undercut, then the bugdust is removed and loaded into a car by hand. Then the face is drilled. Immediately after the close of the shift snubbing shots are fired. The night men rake out the coal thus brought down and clean off the blue-band refuse. The coal raked out is left just in front of the face. The upper shotholes are fired at the close of the night shift. Finally in the day shift the coal is loaded out by machine.

The coal is shot exclusively with permissible powder. In rooms that are 30 ft. wide, eight shots are fired. Four snubbing holes are drilled about 15 in. from the bottom, just above the blue band, and four holes close to the top. To drill the eight holes the electric drill need be set only twice, in

each case at positions about 3 ft. from either rib. Because the drill is thus located, the holes toward the center of the room are necessarily drilled at an angle.

About sixteen sticks of explosive are used for each room. The snubbing holes near the rib are loaded with two sticks each and the center snubbing holes with one stick apiece. Three sticks are used in each of the upper holes near the rib and two in the top center holes.

The coal is undercut by Jeffrey 35 BB shortwall mining machines having 7½-ft. bars. The depth of cut is approximately 7 ft., and the coal loaded per fall in 30-ft. rooms averages 50 tons.

Seventeen men, including the face boss, constitute the normal crew per loading unit. The organization is as follows:

Two men make up the Joy crew. One operates the machine while the

other squares up the place and shovels the loose coal into piles so that on the clean-up the Joy must shift position but once instead of many times. One man is a car pusher. He moves the empty from the nearest switch to the loading machine after the loaded car has been pulled into the clear.

Two mule drivers bring the empty cars from the motor parting to the switch or passing track near the loading machine and take the loaded cars one at a time from the machine to the motor parting.

The clean-up crew averages $2\frac{1}{2}$ man-shifts. Two men usually work together squaring up the face after the loader has left the place. They also lift the bottom ready for the next cut. They load by hand an average of one car, or 2.3 tons, per place.

During the day two men working together undercut the coal and one man working alone drills the face. One of the crew shovels the slack from the undercut and loads about a car of such coal from each place.

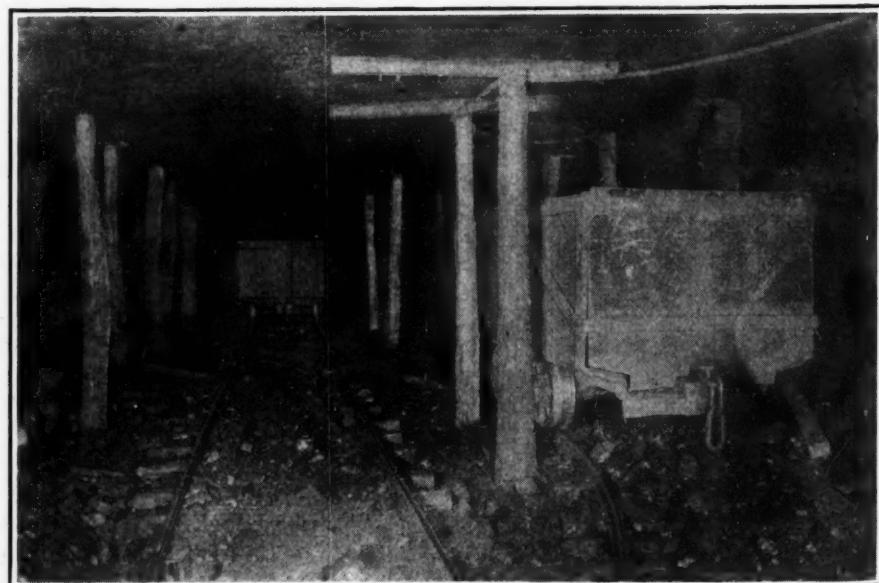
Timber and track work together also average $2\frac{1}{2}$ man-shifts. Five men do the work on two sections—that is, for two loading units.

The clean-up men and driller get their regular work done early enough to load and tamp the snubbing holes by the end of the day shift, and they shoot these holes after the day crew has left the mine.

Two snubbers complete the crew. They are the only men who work at night. Their job is pulling out the snubbing coal and cleaning off the parting. Also they load, tamp and shoot the top holes at the end of their shift.

Local conditions such as adverse

An Empty on the Portable Side Track and a Load at the Machine



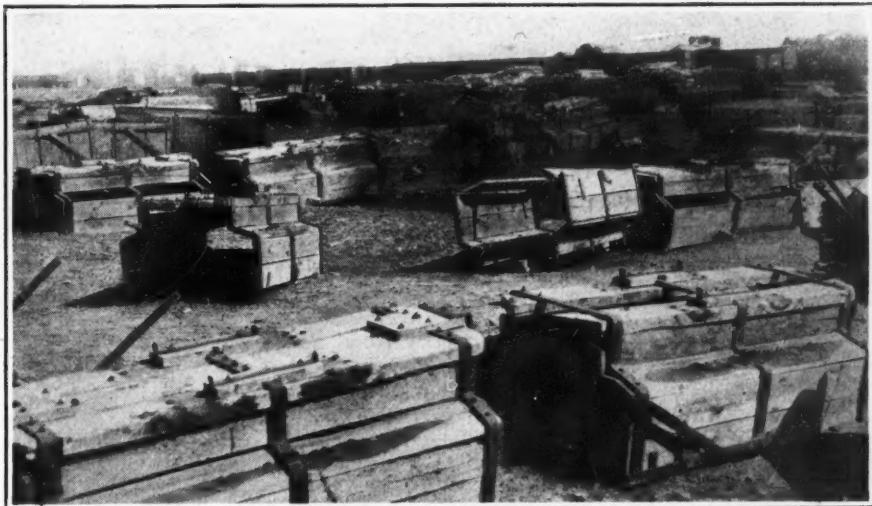
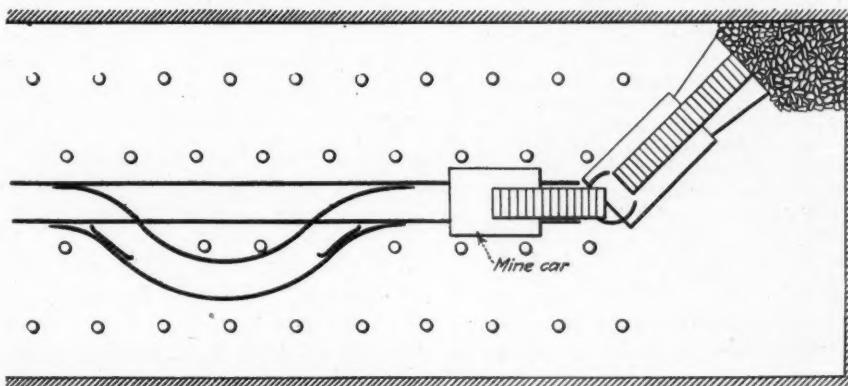
grades, bad top, etc., at times require more men per crew. In some places, for instance, two men are needed to push the cars. One man may be taken off his job temporarily to help another. Thus the man who loads slack sometimes helps the driller, who usually is working in the place at the same time.

Beginning about two years ago the old wooden cars, which had a capacity when loaded by the machine of but 3,600 lb., were replaced by new all-steel Timken-equipped cars which could hold when similarly loaded 4,600 lb. Four hundred of the new cars have been purchased. They are 48 in. high, but the back end, to accommodate the Joy conveyor, is built only 40 in. above the rail.

As indicated by the sketch shown on this page, the rooms have only a single track with two rows of props on either side. Before the places are cut the props are set 30 ft. from what will be the back of the cut. With bad top the distance is decreased to 20 ft. or less. When set within 20 ft. the props of the center rows have to be shifted as the loader works out the place, but those in the outer rows do not have to be moved. Experiments were made of the practicability of double-tracking the rooms, but the idea was abandoned because props had to be set between tracks. These props were in the way of the loader boom in swinging from one track to the other.

The cars are gathered by mules because thereby the investment for motive-power equipment is kept at a minimum. For speedier car changing, gathering locomotives and electric hoists, the latter possibly attached to the loading machines, are being considered. The present method is to move the heading parting every 600 ft., but this is varied to suit local conditions such as grade and character of top.

Timbering and Side Track in 30-Ft. Room



An Acre of Discarded Wooden Cars

To average over 300 tons per machine when loading but one cut per place per day and when shifting cars one at a time with mules every effort must be taken to keep the machine in constant operation. Scraping or taking up the coal left below the undercut assists materially in handling the loading machine, which is of the caterpillar type. When the coal is lifted the machine has an even bottom to work upon. Mr. Stedelin regards the lifting of bottom as an absolute necessity if as large tonnage as he is getting is to be obtained with caterpillar loaders, provided, of course, conditions are like those at the workings described.

Another way to increase production is to keep the loading head working during much of the time of the car change. By skillfully moving the boom conveyor very short distances the machine operator loads about a ton of coal onto the machine ready to dump into the car as soon as it arrives. Any shift in position or cleaning up is done during normal car changes or during longer car delays.

As yet the portable passing side tracks are not installed in every work-

ing place. Mr. Stedelin hopes to use these everywhere and to move them forward with every 50 ft. of advance. One man can easily dismantle, move the parts and re-install the side track in 6 hours.

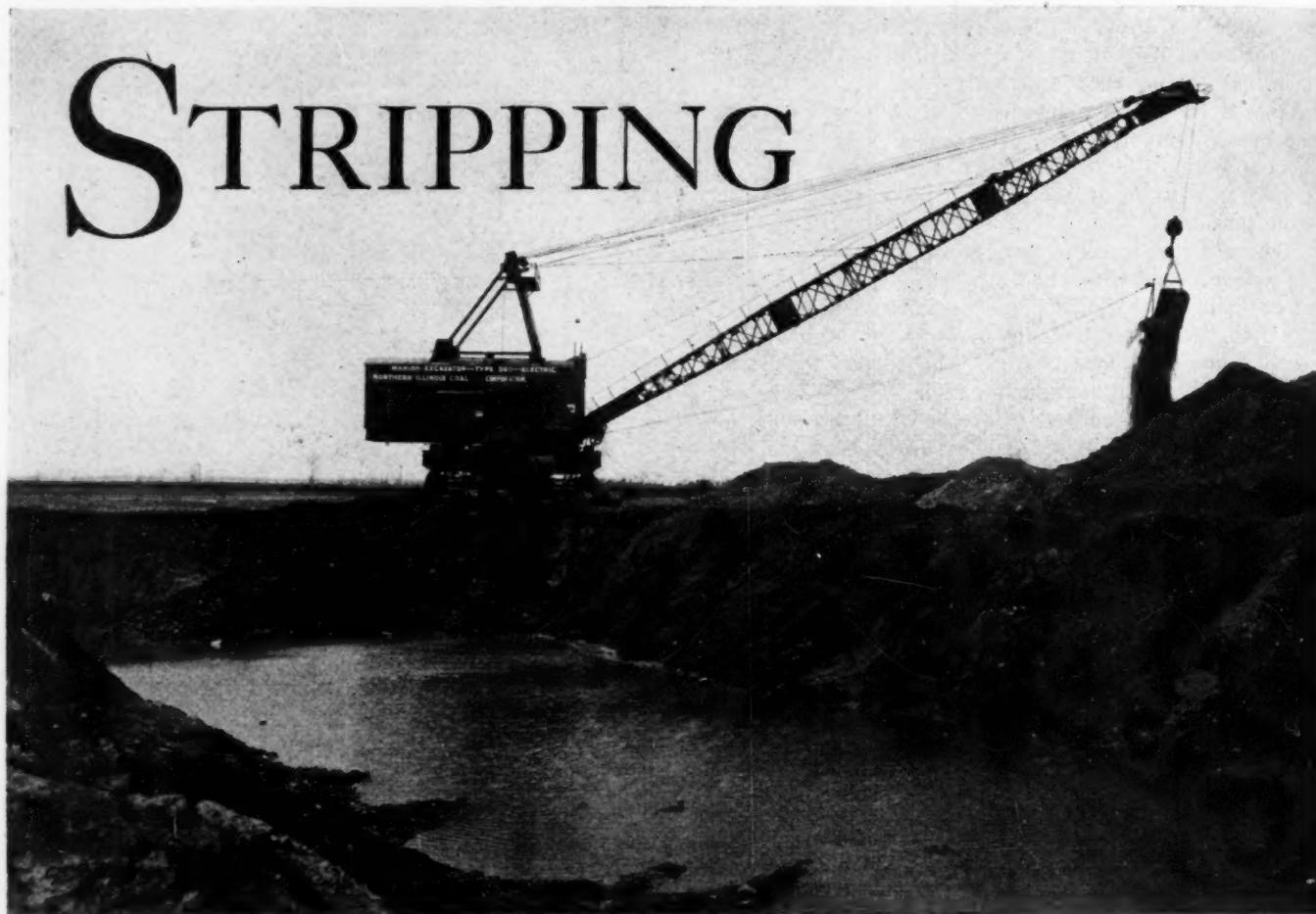
When this side track is being installed the rails of the straight track need not be disturbed. The frog is in two pieces which are held together and in place by a metal wedge. The top of the frog is flush with the top of the straight track rail, and the wheel rides over it on its flange. A guard alongside the opposite rail keeps the car on the track. The switch points are angle-shaped, and when the switch is open they rest on the top of the main rails. The switches are built with a 6-in. throw so that the Joy caterpillars can ride the straight track without hitting the switch points.

The mine is operated with union labor, working under a local agreement which will continue in force till a permanent agreement is signed in Illinois. Most of the coal is sold for steaming purposes. The tipple has five tracks—for lump, egg, nut, screenings and crusher coal. When 2,000 tons was being mined by hand loading nine men were used on the picking tables. With mechanical loading twelve men pick the 1,800-ton production.

Up to late in March, when data for this article were being assembled, the production per loading unit for January, February and March had averaged 290 tons; for February alone the average was 300 tons.

When Dr. Fyke was asked to state how he obtained this production he replied without hesitation: "Only by the intelligent co-operation of the men under the direction of Mr. Stedelin."

STRIPPING



Dragline Working at the
Pit Face

THE OLD Braidwood - Coal City - Wilmington field, in the most northeasterly tip of the Illinois coal basin, long since regarded as an abandoned coal-producing district, is becoming the scene of renewed mining activity through the introduction of strip mining backed by the latest and best equipment adapted to this method of recovery. Production from this district, located only 60 miles southwest of the heart of Chicago and 30 to 50 years ago the principal source of coal supply for the Chicago area, gradually declined as the thicker seams in southern Illinois increased their tonnage. Higher production costs, not exhaustion of the coal, forced the northern field out of business and dotted the countryside with scores of abandoned refuse piles.

This district was the first coal-producing area in Illinois. The first mines were opened from a quarter to three-quarters of a mile back from the crop line. As they worked toward the crop up the pitch of the seam, the roof gradually became poorer, so later mines were sunk farther from the crop line and west

along the crop. Exact knowledge of just where the crop line lay was obscured, for in no place does the crop come to the surface, but it so happened that a strip of coal, roughly 14 miles in length and $\frac{1}{4}$ mile in width, was left between the original shaft mines and the buried crop line.

This strip is now owned and under development by the Northern Illinois Coal Corporation. It contains approximately 30,000,000 tons of coal

THE force of economic pressure is nowhere shown more clearly than in its effect on the development of stripping equipment. From a comparatively simple outfit of steam shovel and narrow-gage track the industry has grown to use giant electric shovels costing from \$250,000 to \$400,000 each, standard-gage track and 40-ton cars. From no preparation it has gone to modern tipples equipped with screens, conveyors and booms.

Brings New Life to

By R. S. Weimer

Chief Engineer and Superintendent
Wilmington Plants
Northern Illinois Coal Corporation

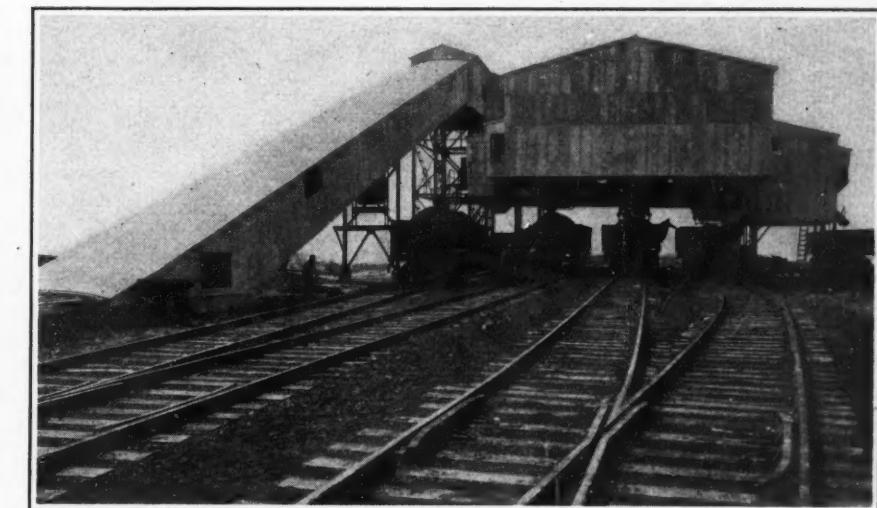
3 ft. in thickness with an overburden ranging from 20 to 50 ft. and averaging 30-35 ft. The company embarked in the development of the Wilmington project only after thorough geological examinations and an intensive drilling campaign carried on through the summers of 1926 and 1927. More than 2,000 test holes were drilled, under the supervision of Allen & Garcia, consulting engineers, with the writer in charge of the field work.

The coal in this area is the No. 2 seam in the Illinois Geological Survey classification. The seam has a gentle pitch to the southwest of about 15 to 20 ft. per mile. It is underlaid by fireclay, and locally by sandstone. It is overlaid by a soft shale, termed soapstone by the miner, which in portions of the field becomes somewhat

sandy and even grades to sandstone. This shale has been planed off by glacial action and probably was covered to a great depth by glacial drift containing gravel and small boulders. The planing action of the glacier — practically horizontal — occurred at what is now approximately 520 ft. A.T. elevation. The coal extending northeast above this elevation was planed off by the glacial action, thus forming the crop which has a strike of northwest-southeast.

Some time in the geological past the overflow waters from Lake Michigan sweeping down the valley of the Kankakee River eroded this drift to within a few feet of the coal at the crop line. As the waters gradually receded they left a deposit of sand and some gravel on the drift and coal measures. This blanket of sand is a quite characteristic beach deposit, varying in thickness from a few feet up to 20 ft., with an average of about 10 ft. Thus the burden over the coal, is, first, a shale natural roof, then glacial clay with a sand and soil above.

The surface topography of this territory, as of any old beach area, is of exceedingly low relief with quite imperfect drainage courses. The strip, lying three miles south of the



Four-Track Steel Tipple

sand gradually diminishes and is not a serious problem because the rate of flow is regular and no seams or pockets of high flow are encountered. From the base of the sand down to the coal the overburden is quite dry, and likewise the coal vein.

The area is being opened in a block four miles in length and a mile in width, bounded on the southeast by the Chicago & Alton R.R. and on the northwest by the Santa Fe, both of which cross the short way of the

angles to the general trend of the crop line, and has a grade ranging from 1 to 2 per cent. The gravity hill for the empty yard, loading yard and storage yard is parallel to this incline and was made from the overburden removed in digging the incline. The tipple is located at about the middle of the lengthwise direction of the incline, thus necessitating back switching of the loaded cars up a hill to the point of dumping at the tipple after they come to the surface of the incline. From this point they re-enter the incline pit down a 4 per cent grade, thus giving easy grades for the moving of the loaded coal out of the pit, and a short, steep re-entry into the pit for empties, and in addition a large "layby" near the tipple.

As the crop line is fairly straight and uniform and there is an absence of the "long-fingered" effect characteristic of the crops formed by stream-action erosion, it will be possible after several months' work to have an almost completely straight

Dying Coal Field

Illinois and three miles west of the Kankakee River, drains chiefly in a westerly direction to the Illinois River. A portion, however, drains to the Kankakee River and is not subject to overflow from either stream. The poorly formed drainage systems; the flat relief and the character of the sand blanket seem to present a most difficult drainage problem, but such is not the case. The flat surface and easily excavated surface sand lend themselves readily to cheap and rapid ditching and diking in almost any direction, making the pits free from any sudden rushes of water during heavy rains and cloudbursts.

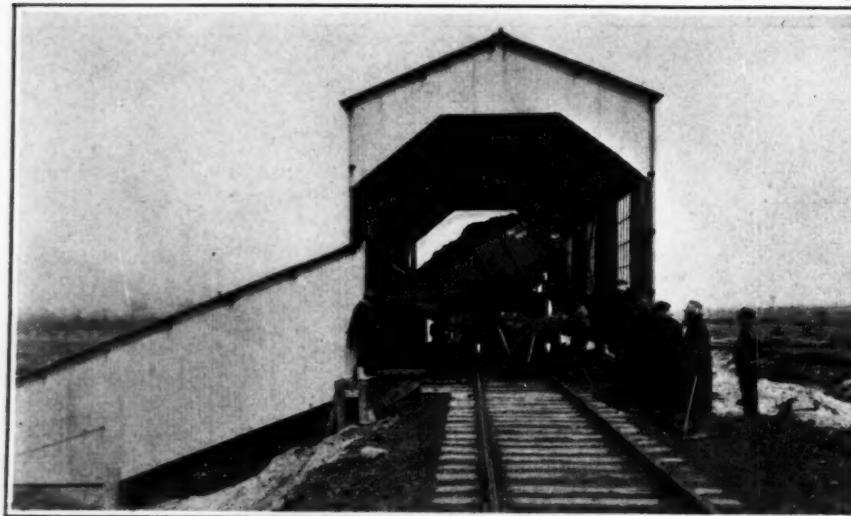
The sand blanket itself has a quite low porosity due to a substantial clay intermixture. The sand, of course, carries considerable sheet water, which bleeds out into the pit from the base of the sand, but because the sand is fairly coarse and quite angular it stands in a nearly vertical wall and does not run while this bleeding takes place. This water coming from the

block. The general layout provides for an entrance incline, parallel to the railroads and half way between them, giving a pit on each side of this entrance incline approximately two miles in length.

This entrance incline is at right

Pit Showing Loading Shovel and Tipple in Background





Dumping the First Car of Coal March 15, 1928

crop line throughout the two 2-mile pits. The advantages gained from this in the haulage and dirt-stacking problems are apparent.

During the summer of 1927 over four miles of drainage ditch was put through parallel to the northwestern boundary and entirely along and a short distance away from the crop line, thus providing for the drainage entirely on the crop side of the pits. Because the ground pitches very gently to the south and west it is an easy matter to drain the surface water away from the solid bank side of the pits. The coal all being below the surface and there being no drainage outlet to that level, it is necessary to pump out all water falling into the pit and that seeping from the banks.

A three-mile spur track was built in from the main line of the Chicago & Alton. The mine-yard tracks provide for storage of 50 empties and a like number of loads, with provision for additional load and empty tracks as needed. Eighty-pound rail of standard gage is used throughout the pit and entire property. The grades in the gravity yards are $1\frac{1}{2}$ per cent above the tipple, 2 per cent through the tipple down to the scale, a vertical curve starting at $1\frac{1}{2}$ per cent from the scale and diminishing until level at the lower end of the load yards. The yard tracks are inter-connected with those in the pit, so standard railroad equipment may be used throughout.

The mine is entirely electrified. A 33,000-volt power line into the operation from Braidwood, a distance of about two miles, was constructed by the Public Service Co. of Northern Illinois. At the substation power is transformed to 4,000 volts by three 500-kva. transformers and carried into the property over a four-wire

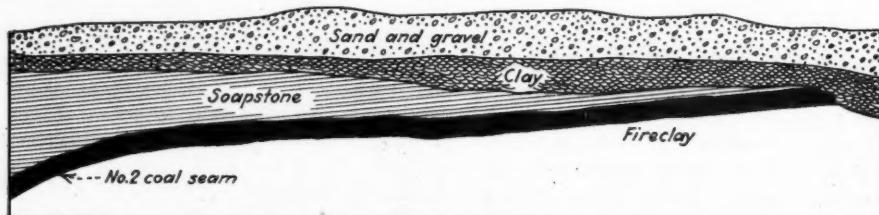
line which is parallel to the incline pit.

At a point some distance before this line reaches the lower end of the incline pit another line is run parallel to the crop line and a distance equivalent to four to five years of stripping back from the crop line. Every 1,000 ft. along this power-line a lateral is run up to the crop line. This layout provides that the 750-ft. 4,000-volt cable supplying the electric strippers with power attaches to the end of the laterals and is moved from one lateral to the next as the strippers progress along the crop line. The cable change from one lateral to another has been made in fifteen minutes. As the pit progresses these laterals will be

A four-track steel tipple was designed and erected by Allen & Garcia. This tipple is supplied with power through three 75-kva. transformers and is equipped throughout with individual-drive 440-volt, a.c. Westinghouse motors connected by Tex-Rope drives. Picking-table and loading-boom conveyors are rubber belts. The entire tipple is controlled from one central point, with push buttons for starting and stopping each motor, and so located that the operator can see the loading booms, the picking tables, the shakers and the pit where the coal is dumped before being elevated to the tipple. A system of electric signals is connected with the central station, making it a central message and control center for the tipple. The operator also controls the movement of the loaded cars with car retarders.

The tipple equipment includes a mixing conveyor. When desired, coal may be diverted from the picking tables to this conveyor instead of going to the loading booms. This diversion makes it possible to load picked mine-run or any combination of sizes from the picking tables.

Coal from the pit is loaded into 40-yd. Koppel air-dump side-tilting steel cars of standard gage. In dumping, the car is tilted 37° deg. by two large air cylinders located on the running gears. As the body is tilted the side of the car opens out, releasing its load when parallel with the bottom of the car and forming an apron over



Stripping Zone Section at Right Angles to the Strike

gradually shortened and removed. Portable skid-mounted transformers are used for auxiliary units.

A modern office and supply building 41 x 73 ft., and a combination machine shop, locomotive barn, boiler room and wash house, 53x95 ft. have been erected. These buildings are of steel, concrete and building tile construction. The shop is equipped with a 10-ton overhead crane, lathe, hydraulic press, planer, power saw, grinders and forge. Additional machines will be added later as needed. All machinery has individual drives, with 440-volt a.c. motors. A Kewanee low-pressure boiler is used for heat and wash water.

which the coal slides into the hopper. The body returns to a normal position when the air is released.

The coal hopper or dump pit is 50 ft. in length and has a tunnel underneath in which are located three reciprocating plate feeders each under a throat in the bottom of the hopper. These feeders can be run singly or all at the same time. They feed on to a steel-slat drag conveyor which empties onto a rubber belt conveyor 4 ft. in width and 250 ft. long which is set at 19° deg. from the horizontal.

This conveyor feeds onto the shakers. The pit is built with the dump side at an angle of 37° deg. and with the opposite side and ends ver-

tical. The floor is level in the direction paralleling the track. The coal slides out of the car and down into the pit with a minimum amount of breakage. For some distance up from each side of the throats the coal itself forms the hips and valleys of the hopper bottom. This method of dumping and style of construction makes for a minimum amount of breakage and therefore is superior to the rotary method of unloading.

The shaking screens are pendulum hung and each is driven by a single eccentric arm located above the shakers. The tipple is equipped with degradation conveyors. There also is a dirt conveyor discharging to a small hopper which can be unloaded either into the pit cars or railroad cars. Provision has been made for future installation of crusher, rescreening plant and wagon loading hopper and chute.

The ratio of overburden to coal, running from 6 to 12, necessitates the most reliable and efficient method of removal in order to maintain coal production. No shooting of the overburden is necessary over most of the property. The incline and the first box or through cut, which is now nearing completion, has been opened by a Marion 360 electric dragline mounted on crawling traction. This dragline, with 150 ft. boom and 6-yd. manganese steel cast bucket, has made a cut 150 ft. wide on the surface to a depth of 20 to 30 ft. It is operated by one man at the controls, has a digging range of 150 ft. radius and 60 ft. depth, and a stacking range of 150 ft. radius to a height of 68 ft. The working weight is approximately 1,000,000 lb. The crawling traction is carried on timbers 12x12x20 ft. made into mats.

Power is supplied through a four conductor cable, one of the conductors being a permanent ground, at 4,000 volts to a motor generator set consisting of a 435-kva. synchronous motor which drives three generators. One supplies d.c. current to the two 175-h.p. hoist and drag motors, another to the 105 h.p. rotating motor and the third supplies 125-volt constant potential for the fields of the synchronous motor and the generators, also for the controls. The hoist, drag and swing motors are series wound.

Starting on Oct. 15, 1927, the dragline excavated through the box cut the entire depth to the coal but since March 1, 1928, when a second and larger stripping shovel was erected,

it is only excavating to a depth of 12 to 20 ft. It has moved the overburden at a rate of 125,000 to 150,000 cu.yd. per month, this through the entire winter, with little loss due to inclement weather.

The larger stripping shovel, which was started March 1, is removing the remaining 10 to 15 ft. of overburden and depositing it on a berm left between the open pit and the dragline stacking pile. This shovel, type 5480, which is the largest digging machine in the world, was designed by the Marion Steam Shovel Co. for this project. It was designed for removing the maximum capacity of the overburden from a depth of 25 to 50 ft. and with the sole idea of getting a maximum digging capacity rather than handling extreme depths of overburden, which will not be necessary in these pits during the life of this machine.

Type 5480 has a working weight of 835 tons, is mounted on self-propelling crawling traction and is equipped with a 12-cu.yd. dipper, 60-ft. dipper handle and 90-ft. boom. It has a maximum lift of 68 ft. and a stacking radius reach of 111 ft. When working it completes a digging and dumping cycle in 40 to 50 seconds. It is supplied with power through a 750 ft. 4,000-volt cable similar to that which feeds the type 360 dragline machine. It is driven by a motor generator set with individual generators for the hoist, crowd and swing motors, these motors all being shunt wound.

These large stripping machines are now working in a tandem arrangement, and it is proposed to continue

this practice, which will provide for the removal of 400,000 to 500,000 cu.yd. of overburden per month.

Coal is loaded into the 40-yd. dump cars by a Marion type 37 electric shovel having a 2-yd. dipper. This machine is supplied with power at 440 volts from three 50-kva. portable sled-mounted transformers which are carried in the pit with 4,000-volt cable from transformers to the laterals supplying power to the large strippers. Type 37 has Ward-Leonard control.

Holes for shooting the coal are drilled with Sullivan rotator drills supplied with air at 90 lb. pressure from a Sullivan 440-volt belt-driven portable air compressor. The coal is being lightly shot with duPont pellet powder.

A 5-ton caterpillar tractor to clean the coal and shift track, and a trenching machine will be added.

The coal is being hauled out of the pit in 4- to 5-car trips; thus only 8 to 10 trips per 8-hour day are necessary to maintain a production from one pit of 1,200 to 1,600 tons.

As the entire plant is electrically operated otherwise, it was very much desired to do the haulage work without steam. A Davenport gas-electric 30-ton locomotive is being tested out. Later delivery of a Diesel locomotive by the Plymouth Locomotive Co. will be added to the haulage equipment for trial. The Davenport locomotive is powered with two 125-h.p. 6-cylinder Buda gas engines each driving a 250-volt d.c. generator; each generator drives two 250-volt axle-mounted motors.

(Turn to page 290)

Largest Shovel in the World Set Up Near the Tipple





SCOWS . . . *Load One-Ton Coal Slabs Into Mine Cars*

TWO or three years ago a company in the Arkansas field tried a new method of mining, locally known as the "scow system," quite unlike the former conveyor system shown in the headpiece. This has proved so successful that it is worthy of consideration in regions having similar conditions.

The developments about to be recorded are primarily those of the small Paris coal field, which lies south of the Arkansas River in Logan County. The coal is a high-grade smokeless fuel used exclusively for domestic purposes. The bed is clean; its thickness ranges from 18 to 32 in. The seam pitches on an average about 3 or 4 deg., and the cover where it is now being worked is about 160 ft.

For the last ten or twelve years the field has been worked almost exclusively by longwall, but until about five years ago these workings

By Heber Denman

*President, Paris Purity Coal Co.,
Clarksville, Ark.*

had a circular face either with several independent roadways or with face tracks leading to main roads.

These systems were successful and fairly satisfactory, but the cost of production was at all times too high to enable the Paris coals to compete with the softer coals produced from the thicker beds of the state.

About five years ago the Paris Purity Coal Co. entered the field and after operating one season came to the conclusion that something must be done to get larger outputs from the mines and to cheapen the cost of coal production. After studying different systems of mining and a trip to Alabama R. G. Johnson, the general manager, concluded that the use

of conveyors offered the best solution of the problem.

In order to produce the high percentage of lump necessary to compete with the big beds the coal cannot be shot but has to be broken down by roof pressure. After the coal has been undermined in the shale beneath it and the roof pressure has broken down the cut it is difficult for the casual observer to tell that it has ever been undercut and brought down, as it drops in a solid wall which is broken only at long distances and with only an occasional crack discernible. This looks like an impossible situation for any kind of mechanical loading, as it is not permissible to shoot the coal, and yet it lies in one solid slab for hundreds of feet, apparently tight on the top and bottom.

The nearest possible approach to mechanical loading seemed to be to

load the coal by hand onto conveyors and by this means to transport it to the road-head. The coal was broken by sledge and wedge at the wall by the loaders, and the large chunks were loaded on the conveyor. The men who loaded the coal were paid day wages. These conveyors have been generally successful in the Paris field and practically all the mines in that area are now operating exclusively by this means.

Like most systems of mining, the method described has many drawbacks, and a few of the smaller operators have discarded their conveyors and returned to the old system, still using longwall but loading the coal directly into cars at the face. In many instances the use of conveyors did not directly decrease the cost of production. It did, however, increase the capacity of the mine, principally because less development work was needed and a shorter wall could be operated.

In the old system of longwall mining the wall did not advance, as an average all over the mine, much over a foot a day. It usually took from two to three shifts to clean up the cut of coal brought down by the kerf made by a 4-ft. cutter bar and the entire circle of the mine was not cut at any one time. Where the conveyors are used the machine which makes the kerf has a cutter bar 4 ft. to $5\frac{1}{2}$ ft. long and, where the conveyors are successful, a cut is taken out each day.

This system of operation, which might be termed intensified mining, gives much larger outputs from smaller areas, whereas with the old system the cars were necessarily

small and haulage costs high. With the conveyor system of mining large cars can be used, even in the thinnest beds, thus lowering the cost of hauling and handling the coal.

Many of the coal operators realized the shortcomings of the conveyor system of mining. In the first place, the loading is entirely by hand, in a low and cramped place, and only by some degree of skill and hard labor can a reasonable tonnage of this coal be broken and loaded. The present tendency is to eliminate as far as possible hard manual labor, letting machinery do as much of the work as can be arranged. Another of the disadvantages of the system of mining is that the conveyor must be protected for the entire length of the wall and a large space must be kept open between the face of the coal and the break line. This it is difficult to do when the bigger roof breaks occur. In some mines it has been necessary to close down mining operations for several days when the roof was breaking.

Two or three years ago the Jewell Coal Co., now the Beatty Coal Co., with George Colville as general manager, devised and introduced into its mine a method of loading which has since proved successful. It is locally termed the scow system of mining. It is exceedingly simple and does not require much equipment, and that equipment is not such as deteriorates rapidly. Only the ropes are subject to rapid wear.

In starting the system the mine, or a portion of it, where this method is used is laid out as in panel conveyor work, namely with a 250-ft. or 300-ft. wall at right angles to a main road

which is brushed in the bottom so that the pavement of the coal is higher than the top of the mine cars.

As in conveyor mining, the layout varies. In some instances all the coal from one 300-ft. wall or panel is brought to one roadhead. In others there is a double panel with a 250-ft. or 300-ft. wall on each side of the main road. The first plan tried in the Jewell mine was with a 300-ft. wall on each side of the roadhead with the roadway driven in advance of the face of the coal for some distance so that empty cars might be handled. This plan is shown in Fig. 1.

The scows are merely rectangular sheets of steel plate with their ends cut into an oval shape as shown in Fig. 2. The plates used at the Jewell mine are about $3\frac{1}{2}$ ft. wide, 18 ft. long and $\frac{1}{16}$ in. thick. One of these scows, or steel plates, is provided for each wall or panel. The plates are pulled back and forth by main and tail ropes or by endless ropes pulled by a small electric hoist either located in the roadway or opposite to the wall from which the coal is being pulled.

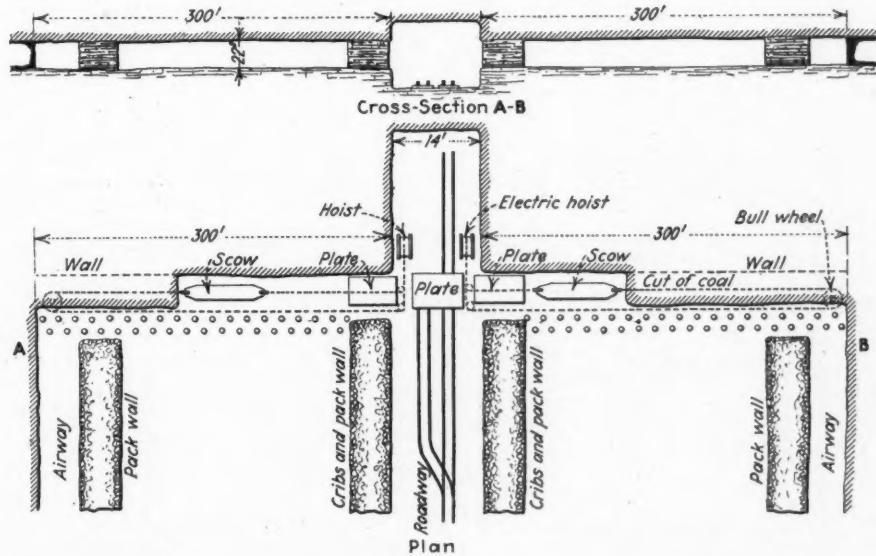
THE mining and loading method used in this first panel was as follows: During the night shift the two 300-ft. walls were undercut in the shale to a depth of 3 ft., and sprags were driven in the kerf to keep the coal from breaking down until it was time to load it out. Loading started in the morning of the day shift, when the sprags at the end of the wall next to the roadway were knocked out and the coal for a short distance was loaded out by hand.

After room was made for the scow to operate it was pulled by the tail rope under the block of undermined coal, the oval ends of the plate knocking out the wooden sprags. As soon as these sprags were removed a slab of coal the width of the cut, 3 ft. to $3\frac{1}{2}$ ft. wide and 12 ft. to 14 ft. long, dropped down on the scow. If it did not fall immediately a wedge was driven between the coal and the roof to compel it to fall.

As soon as this was done the scow with its load of coal, weighing one to three tons, was pulled by the electric hoist to the roadway, where it ran onto a stationary steel plate. No sooner was this large slab of coal landed than a short wire rope, of about $\frac{1}{2}$ -in. diameter, was thrown over it and the scow was pulled out from underneath it. The scow then went back for another load of coal.

This large slab, which was cracked and broken by its passage over the

Fig. 1—Scows Moving the Undercut Face in Sections Off the End



uneven bottom to the main road, was loaded onto steel flat cars. Opposite the wall the mine-car track is double and has a smooth steel plate opposite the two loading plates, as in Fig. 1.

The empty cars are moved up by hand to the steel plate and turned also by hand across the entry on this plate so as to be at right angles to the direction of the roadway. Then the electric winch pulls the slab of coal, in length about 8 ft., onto these flat cars. The loaded flat car is then turned 90 deg. onto the loaded road and is dropped down the track. This system goes on simultaneously from both walls.

A SMALL band of slate adheres to the top of the chunks of coal. These pieces of slate are chipped off by two men. The coal bed at this place is about 22 in. thick, yet some of the slabs of coal on the mine cars weigh nearly a ton. These large chunks of coal are broken in the tipple by air drills.

At first thought this system might seem a little slow and by no means inexpensive. To get the proper point of view one must compare this method with other systems by which coal in beds 22 in. thick are mined.

On the night shift there are two machine crews, one on each 300-ft. wall or panel. If everything goes well each of the two machines cuts its respective wall during the night shift. On the day shift one man operates the electric hoist for both walls; one man works in front of each wall at the point where the coal is loaded, each scow is ridden by one man and at the car-loading point are four men who handle all the coal from both walls, two loading the cars and two cleaning, making a total of nine to eleven men.

When I visited the mine these nine men in one shift of eight hours cleaned up 600 ft. of wall and had time to set props along it and to do other work. Mr. Colville told me that a cut of about 600 ft. was cleaned up practically every day in the day shift by a crew of nine to eleven men.

Fig. 3 shows another method of handling and unloading the scows in which the ropes pull in straight lines. Experiments are now being made with this system, and it is believed that it will be simpler to handle than the arrangement just described. The drive will be simply a small and low double-drum electric hoist with a friction clutch. This hoist will have an over-all height of not more than

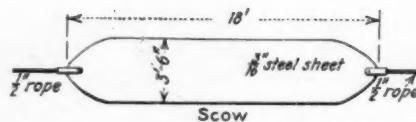


Fig. 2—Scow on Which Coal Rides

20 in., and will be driven by a 10-hp. motor.

These hoists will be semi-portable so that they may be moved from one side of the road to the other, across a dumping bridge that spans the roadway which has been brushed in the bottom. Only one 300-ft. wall will be loaded out at a time. The general layout and the scows will be the same as used in the other systems. The bridge, which is really a dumping platform, will have some kind of scraper or other mechanical arrangement for pushing the lumps of coal into the mine cars which pass underneath this bridge. As previously stated, the details are subject to many variations.

In this system of mining, as one can readily see, there is little hard manual labor. The weight of the roof breaks down and loads the coal onto the scows, and the slabs of coal left on the loading platforms are slidden off onto the cars by ropes and an electric winch. In this small bed of coal with a short cutter bar, 3 ft. long, 110 tons of coal can be loaded by nine to eleven men.

The wall is safer and easier to

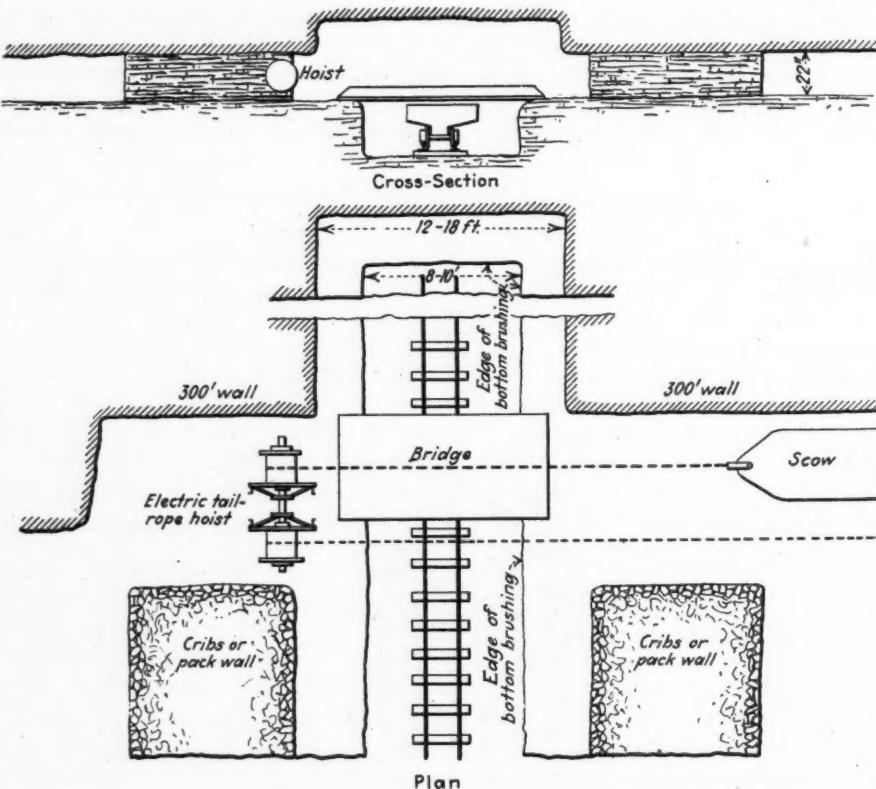
maintain than with conveyor loading so long as the coal is loaded off the end of the cut instead of simultaneously along the entire length of the wall. Thus props and timbers can be kept close to the coal. With conveyor loading, the props and other supports must be kept back a distance of 5 ft. or 6 ft. from the face with occasional props between the conveyor and the coal to support loose rock.

The general manager says that this system is more satisfactory than any other ever used in the mine. The great drawback to its introduction into the other mines in the Paris field is that it is applicable only under the conditions encountered in the mine where it is used.

The coal must be of practically uniform thickness and part easily from the roof and the cleats of the coal must be pronounced and run in certain definite lines so that the coal will break at the face without saw-tooth edges.

Otherwise the block of coal will bind, and the scow will be unable to move it from the face. If this should happen the slab of coal would have to be broken up before moving, making the system expensive and impracticable. In places where thick drawslate sticks to the top of the slab of coal it is practically impossible to use this system of mining.

Fig. 3—In New System Rope Hoist Is in Line With Haulage



WHERE INDIANA COAL GOES

A Study of Distribution Trends Since 1915

By *Sydney A. Hale*
Managing Editor, Coal Age

INDIANA coal distribution trends since 1915 in many respects have paralleled the broader movements of tonnage from the sister and competing state of Illinois during the same period ("Where Illinois Coal Goes," *Coal Age*, Vol. 33, p. 161). In both states the peak of production was reached in 1918. In both states the war period saw shipments to markets which never had been considered tributary to the coal fields of Illinois and Indiana and which ceased to buy coal from those states after the war-time emergency had passed.

During the years under review there have been sharp fluctuations both in the total outputs and in their allocations to states lying outside the concentrated area in which Illinois and Indiana have distributed and still distribute the greater part of their annual production. Some of the gains made during the war era have been held.

As in the case of Illinois, the railroads are the largest consumers of Indiana coal. Except during the war years, their purchases have exceeded the aggregate buying of Indiana coal by Indiana industries and domestic consumers. Moreover, railroad fuel purchases have been increasing while sales as a whole have been declining.

IN 1915, for example, rail shipments of Indiana coal to commercial buyers within that state totaled 5,420,906 tons. In the same year railroad fuel tonnage approximated 6,000,000 tons. In 1925 the commercial shipments were 6,514,171 tons; railroad fuel purchases by lines serving the Indiana mines were over 7,400,000 tons. Commercial shipments of Indiana coal to points within the state in 1926 were 6,775,831 tons; railroad fuel tonnage approximated 9,000,000 tons.

That price has not been the sole influence in swelling the volume of railroad fuel purchases was brought out in testimony recently presented at Washington before the Senate committee on interstate commerce investigating the coal situation. The presi-

dent of one of the leading operating companies in Indiana presented evidence to the committee showing average realizations on all coal sold of \$3.164 in 1922, \$2.381 in 1923, \$2.166 in 1924, \$1.937 in 1925 and \$2.038 in 1926. During the same period the average prices on coal sold to one of the major trunk line systems of the country were \$3.426 in 1922, \$2.588 in 1923, \$2.348 in 1924, \$2.080 in 1925 and \$2.183 in 1926.

An important factor in broadening the Indiana market for railroad fuel has been the acquisition of two of the smaller Indiana coal roads by larger systems. The Chicago, Milwaukee & St. Paul took over the old Walsh line—the Chicago, Terre Haute & Southeastern—and the Cleveland, Cincinnati, Chicago & St. Louis absorbed the Evansville & Indiana. These changes naturally led to larger buying of Indiana coal by the controlling railroads. As a result the percentage of Indiana coal going to the railroads has risen to approximately 40 per cent of the total output.

The bulk of the strictly commercial business is confined to Indiana and Illinois. As shown in Table I, in 1915 these two states absorbed approximately 96 per cent of the commercial shipments; during the war period the percentage dropped to 87

and in 1926 it approximated 90 per cent.

Whether Indiana has won or lost in its attempts to extend its markets in recent years depends largely upon whether a pre-war or war base is made the criterion. If the comparison is made with 1915, substantial progress has been made both in trans-Mississippi territory and in the Northwest. If, on the other hand, the standard is 1918, when demand was inflated by war needs and distribution artificially controlled by the zoning regulations of the United States Fuel Administration, losses are registered in every section except Minnesota, Missouri, Nebraska, South Dakota and scattered areas.

Seven veins of Indiana are worked commercially. The most marked change in the internal set-up during the past decade has been the relative growth of Fifth Vein coal. The percentage increase in this coal has been won at the expense of the other six, but Fourth Vein coal, considered by many the premier coal of the state, has been the chief sufferer. Fourth Vein production, which was 8,352,440 tons in 1917, dropped to 5,048,533 tons in 1926. During the same period the output of Fifth Vein coal increased from 13,201,910 tons to 14,807,785 tons.

This increase is all the more marked when it is remembered that the total output of the state decreased from 26,056,267 tons in 1917 to 22,655,136

TABLE I—DISTRIBUTION OF INDIANA COMMERCIAL SHIPMENTS

To	1915	1917	1918	1923	1926
Arkansas				150	194
Illinois	4,044,528	5,165,000	6,015,607	5,250,603	4,861,367
Indiana	5,420,906	10,293,146	11,286,804	7,426,344	6,775,831
Iowa	149,046	—	89,796	400,642	328,366
Kansas	149	247,000	—	96	2,145
Louisiana			23,232	—	—
Michigan	6,086	674,000	1,739,424	128,438	85,447
Minnesota	72,934	199,000	27,792	185,777	61,338
Missouri	12,632	54,000	1,903	140,168	107,596
Nebraska	2,833	9,000	1,932	18,112	22,467
North Dakota	3,255	3,000	240	1,331	—
South Dakota	3,897	15,000	576	18,646	4,747
Tennessee	33	—	2,284	—	—
Wisconsin	128,190	564,000	617,184	773,761	455,957
Other States	—	270,000	145,094	203,132	221,282
Total	9,844,489	17,493,146	19,952,114	14,549,234	12,927,101

Note—In the allocation of tonnage to individual states coal shipped to certain Mississippi and Missouri River crossings has been arbitrarily assigned where original data show group destinations instead of individual receiving points. These allocations, as well as the allocation of Indiana tonnage within the Chicago Switching District to Illinois, are shown in the footnotes accompanying the detailed analysis of Indiana distribution for 1923-26 (Table II).

tons in 1917. In other words there was a decline of 3,401,131 tons in total output and an increase of 1,605,875 tons in the production of Fifth Vein coal. Gibson, Knox, Pike, Sullivan, Vermilion and Vigo counties were the centers of heaviest production of Fifth Vein coal in 1926.

Compared with 1917 the greatest gains in Fifth Vein output were made in Gibson, Pike and Sullivan counties. In the first-named county the output rose from 461,877 tons to 1,295,844 tons. Pike County output in this vein increased from 978,672 to 2,574,445 tons and Sullivan from 742,529 to 2,966,527 tons. There was a slight decrease in 1926 Knox County output as compared with Fifth Vein production from that field in 1917, a drop of about 14 per cent in Vermilion County and a decline from 3,489,856 tons to 1,613,847 tons in Vigo County.

Reports on coal production by seams the past decade, compiled by Jonas Waffle, traffic manager, Indiana Bituminous Coal Operators' Association, show the following shifts in percentages of production by veins for selected years:

PER CENT OF TOTAL OUTPUT BY VEINS				
Vein	1927	1920	1923	1926
3	5.42	4.70	2.50	3.86
4	32.05	27.68	32.68	22.29
5	50.67	54.79	56.42	65.36
6	7.71	8.78	6.11	5.96
7	0.43	0.97	0.69	0.36
M*	1.29	1.37	0.90	0.46
B*	2.43	1.71	0.70	1.71

*M-Minshall; B-Brazil block.

The explanation of the failure of Indiana to retain its earlier market position is to be found in the increasing competition of West Virginia and Kentucky coals. In the competitive battle Fourth Vein Indiana coal has been the hardest hit because this particular coal in years gone by enjoyed a wide market as a specialty fuel in metallurgical work, brick making, general ceramics and glass plants. For these purposes the coals from the Southeast can more readily gain a foothold than they might as straight steam fuel.

To this competition has been added internal competition from the exploitation of the Glendora bed in the No. 5 seam in Sullivan County. This coal has found a place not only as a domestic fuel but in malleable iron plants, gas producers and other specialty work. As a result of this Fourth Vein coal has been caught in a competitive whirlpool. When Fourth Vein is marketed as a straight steam coal it must of course meet the competition of other Indiana coals and of Illinois tonnage—a competi-

tion intensified by the declining production in those two states. To this last competition has been added the competition from west Kentucky.

Prior to the entrance of the United States into the World War the quantity of western Kentucky coal moving to markets north of the Ohio River served by Illinois and Indiana producers was negligible. In 1923 the western Kentucky commercial shipments to these markets had risen to 3,569,072 tons; in 1924 the quantity dropped to 2,527,899 tons, only to jump to 4,260,385 tons in 1925 and 6,482,440 tons in 1926.

Southern West Virginia and eastern Kentucky have taken still heavier toll. In 1923 mines in the areas named shipped 4,905,830 tons to points in Indiana outside of the Chicago Switching District. In 1926 the volume had increased to 7,035,337 tons—an increase of 2,129,507 tons. Indiana shipments to points within

the state, however, decreased only 650,513 tons. But Illinois shipments to points in Indiana outside the Chicago Switching District fell off 2,024,590 tons. The combined decrease in Illinois and Indiana shipments was 2,675,104 tons. The difference between that decrease and the increase from West Virginia and eastern Kentucky—545,596 tons—gives some hint of the effectiveness of western Kentucky competition.

That non-union competition has been the biggest factor in retarding the marketing of Indiana coal in recent years is, of course, patent. But to say, as is frequently done, that the lower mine prices quoted in the non-union fields is the only reason why Indiana coals have been losing out hardly tells the whole story. Some weight must be given to quality in the specialty field and to improved transportation. Even the most ardent advocate of the use of Fourth Vein

TABLE II—ANALYSIS OF DISTRIBUTION OF

To	Year	Linton-Sullivan			Brazil-Clinton			Evansville		
		Coarse	Fine*	Total	Coarse	Fine*	Total	Coarse	Fine*	Total
Illinois ¹	1923	1,455,556	617,682	2,073,238	1,517,317	806,962	2,324,279	19,508	13,412	32,920
	1924	1,255,711	789,636	2,045,347	1,080,387	825,496	1,905,883	9,046	8,171	17,217
	1925	945,743	901,123	1,846,866	919,118	941,175	1,860,293	21,289	5,641	26,930
	1926	836,326	844,014	1,730,040	865,020	1,185,097	2,048,117	4,446	9,028	13,574
Indiana ²	1923	2,555,687	1,144,189	3,699,876	1,331,987	540,990	1,872,977	4,540	486	5,026
	1924	1,858,434	950,343	2,808,777	1,003,649	498,495	1,502,144	3,774	113	3,887
	1925	1,439,777	1,029,410	2,469,187	893,260	475,560	1,368,820	2,720	56	2,776
	1926	1,513,843	1,053,981	2,567,824	852,011	460,097	1,312,108	2,171	.....	2,171
Iowa ³	1923	161,579	30,723	192,302	152,662	17,240	169,902	.....	.....	.....
	1924	156,700	32,325	189,025	142,556	69,222	211,778	.....	.....	.....
	1925	128,702	31,777	160,479	130,074	125,676	255,750	.....	.....	.....
	1926	102,661	21,137	123,798	110,450	78,326	188,726	.....	.....	.....
Kansas ⁴	1923	2,041	.....	2,041	.....	.....	39	.....	.....	.....
	1924	3,842	75	3,917	39	.....	39	.....	.....	.....
	1925	3,408	.....	3,408	.....	.....	48	.....	.....	.....
	1926	2,604	.....	2,604	48	.....	48	.....	.....	.....
Michigan.....	1923	39,099	18,247	57,346	46,903	2,834	49,737	194	541	735
	1924	21,911	11,015	33,006	5,536	474	6,010	.....	.....	.....
	1925	3,839	14,809	18,648	1,577	94	1,671	.....	.....	.....
	1926	9,477	18,132	27,609	9,727	5,704	15,431	.....	.....	.....
Minnesota.....	1923	43,412	9,218	52,630	83,851	17,034	100,885	.....	.....	.....
	1924	48,565	15,980	64,545	60,227	7,789	68,016	166	.....	166
	1925	38,407	17,099	55,506	53,130	13,128	66,258	.....	.....	.....
	1926	17,002	4,911	21,913	29,479	8,111	37,590	.....	.....	.....
Missouri ⁵	1923	3,649	925	4,574	1,170	489	1,659	45	.....	45
	1924	6,204	203	6,407	5,665	1,321	6,986	.....	.....	.....
	1925	5,549	304	5,853	7,568	.....	7,568	.....	.....	.....
	1926	4,378	252	4,630	9,216	745	9,961	.....	.....	.....
Nebraska ⁶	1923	13,840	343	14,183	2,654	66	2,711	.....	.....	.....
	1924	24,379	3,506	27,885	1,263	229	1,492	.....	.....	.....
	1925	24,936	3,264	28,200	524	101	625	.....	.....	.....
	1926	18,743	2,844	21,587	117	.....	117	.....	.....	.....
North Dakota.....	1923	596	47	643	559	.....	559	.....	.....	.....
	1924	851	95	946	204	.....	204	.....	.....	.....
	1925	489	.....	489	460	.....	460	.....	.....	.....
	1926	.....	.....	.....	.....	.....	.....	.....	.....	.....
South Dakota.....	1923	10,288	853	11,141	5,348	47	5,395	.....	.....	.....
	1924	6,348	238	6,586	2,035	147	2,182	.....	.....	.....
	1925	4,506	140	4,196	983	185	1,168	.....	.....	.....
	1926	3,204	.....	3,204	656	97	753	.....	.....	.....
Wisconsin.....	1923	130,064	100,199	230,263	273,541	206,471	480,012	221	.....	221
	1924	109,505	56,119	165,624	178,358	138,360	316,718	.....	.....	.....
	1925	95,481	70,202	165,683	180,831	140,742	321,573	.....	.....	.....
	1926	84,311	51,749	136,060	155,282	140,946	296,228	.....	.....	.....
Other States.....	1923	2,995	10,997	13,992	9,472	953	10,425	.....	.....	.....
	1924	671	370	1,041	474	.....	474	.....	.....	.....
	1925	919	.....	919	.....	.....	.....	.....	.....	.....
	1926	283	438	721	114	244	358	.....	.....	.....
Totals.....										
(1) Excludes shipments to East St. Louis, but includes tonnage to Bettendorf and Davenport, Ia., and to Buffington and Gary, Ind.										
(2) Exclusive of tonnage to Chicago Switching District Points in Indiana.										
(3) Exclusive of shipments to Bettendorf, Council Bluffs and Davenport.										

(1) Excludes shipments to East St. Louis, but includes tonnage to Bettendorf and Davenport, Ia., and to Buffington and Gary, Ind.
 (2) Exclusive of tonnage to Chicago Switching District Points in Indiana.
 (3) Exclusive of shipments to Bettendorf, Council Bluffs and Davenport.

concedes the right of the Southern coals to compete with Fourth Vein on a quality basis.

On the effect of improved transportation service one Indiana observer of wide experience remarks:

"The ability of the railroads to render efficient service, starting with the year 1924, has had its effect upon the production and sale of Indiana coal by reason of the fact that the consumer is now assured of eastern Kentucky and West Virginia coals upon reasonably short time schedules. The large steel plants in the Chicago district that formerly used some Indiana Fourth Vein coal in their furnaces and for other purposes have abandoned the Indiana field entirely in favor of the West Virginia and eastern Kentucky coals largely because they are able to get quicker outturns in their plants, and the labor saving thereby effected more than offsets the freight differentials."

Two other factors are playing a growing part in the market situation. These factors are the increasing tonnage coming from the strip mines and the progress of mechanization underground. In 1917 only 4.89 per cent of the output of the state came from the strip pits. The tonnage so recovered that year was 1,273,253 tons. In 1927 the percentage was 15.46 and the strip-pit output 3,501,449 tons. Last year when many shaft mines were down six months strip-pit output rose to 4,390,927 tons and constituted 24.95 per cent of the state's production.

Indiana also has made rapid strides in mechanical loading. The greatest growth in this direction has been in the Fifth Vein coal in the southern part of the state. In 1925 the quantity of shaft-mined coal loaded mechanically represented 8.08 per cent of the total shaft-mine output. Last year the percentage was 11.30.

LETTER To the Editor

Answers G. W. Evans

Some of the remarks in George Watkins Evans' paper before the Feb. 29 meeting of the Rocky Mountain Coal Mining Institute call for reply. He remarked: "We have tried various types of vibrating screens and found difficulty with two . . . where the deck is inclined at an angle of approximately 30 deg." Again, "we found that when we attempted to handle any capacity such as 25 tons per hour through a 4-in. screen we had difficulty." Then he says: "Several of the mines in the Alberta side of the Crows Nest Pass district have installed air-cleaning units . . . and vibrating screens inclined at a fixed angle, and when the coal is damp, they have difficulty due to masking of the screens."

The statements by Mr. Evans just quoted may mislead those not fully acquainted with the true conditions, and I feel justified in saying a few words to avoid any misunderstanding of the situation.

There are three dry cleaning plants in the district mentioned and all are equipped with Hum-mer screens. There are five Hum-mer equipped dry-cleaning plants in the United States and two under construction. No Hum-mer screens have ever been installed or "tried" at Corbin.

The entire success or failure of the dry cleaning of coal unquestionably hinges upon the ability to screen efficiently and inexpensively, and experience has proved a "he-man" screen requisite for the job. Disregard of this has resulted in disappointment in some cases. The Alberta dry-cleaning plants referred to by Mr. Evans are considered satisfactory and efficient plants, and the interference in their operation from wet coal is negligible. Operation interference in wet washeries from causes not found in dry-cleaning plants are of quite common occurrence. If a wet or a dry plant was ever built entirely free from operating difficulties, I never have heard of it.

We all "live and learn." With our constantly widening experience with the Hum-mer we have learned much about the handling of wet coal and other wet materials. We have recently made several Hum-mer installations making a 4-in. separation of wet coal in which 28 sq.ft. of screen cloth are successfully screening 100 tons per hour of which from 50 to 70 per cent passes through the screen.

Screen capacity always is governed to a large extent by the screen analysis of the coal. By this I mean the percentage that should pass over and through the screens and, what is of even greater importance, the percentage of material of a size just a little finer than the openings in the screen.

G. R. DELAMATER,
The W. S. Tyler Co.
Cleveland, Ohio.

INDIANA COMMERCIAL SHIPMENTS: 1923-26 (In Net Tons)

Boonville			Princeton			Totals			To
Coarse	Fine*	Total	Coarse	Fine*	Total	Coarse	Fine*	Total	
397,806	118,375	516,181	191,245	112,740	303,985	3,581,432	1,669,171	5,250,603	
301,139	101,850	402,989	197,600	158,826	356,224	2,843,883	1,883,979	4,727,862	Illinois ¹
439,106	142,618	581,724	301,624	164,772	466,396	2,626,880	2,155,329	4,782,209	
434,924	155,204	590,128	244,757	234,551	479,308	2,385,473	2,475,894	4,816,367	
490,208	56,534	546,742	1,056,016	245,707	1,301,723	5,438,438	1,987,906	7,426,344	
613,907	146,334	760,241	974,404	329,854	1,304,258	4,454,168	1,925,139	6,379,307	Indiana ²
1,044,006	248,237	1,292,243	1,010,111	371,034	1,381,145	4,389,874	2,124,297	6,514,171	
1,199,683	299,709	1,499,392	1,029,926	364,410	1,394,336	4,597,634	2,178,197	6,775,831	
16,145	1,336	17,481	19,589	1,368	20,957	349,975	50,667	400,642	
10,299	10,299	36,906	725	37,631	346,461	102,272	448,732	448,732	Iowa ³
11,095	6,597	17,692	19,147	580	19,727	289,018	164,630	453,648	
4,305	102	4,407	11,224	161	11,385	228,640	99,726	328,366	
104	104	169	169	4,050	2,041	104	2,145	2,145	Kansas ⁴
		37	37	3,445	3,445		3,445	3,445	
		51	51	2,703	2,703		2,703	2,703	
5,727	1,206	6,933	6,765	6,922	13,687	98,688	29,750	128,438	
798	798	5,711	1,184	6,895	34,036	12,673	46,709	46,709	Michigan
1,420	182	1,602	67,951	3,096	71,047	74,787	18,181	92,968	
12,147	12,147	29,444	816	30,260	60,795	24,652	85,447	85,447	
4,467	467	4,934	23,163	4,166	27,329	154,893	30,885	185,777	
6,222	187	6,409	17,631	5,758	23,389	132,645	29,174	162,359	Minnesota
5,349	508	5,857	5,699	571	6,270	102,751	31,306	134,057	
890	890	945	945	945	48,316	13,022	61,338	61,338	
90,401	43,438	133,839	51	51	95,316	44,852	140,168	140,168	
122,042	52,523	174,565	276	276	134,187	54,047	188,234	188,234	
93,259	20,043	113,302	.....	.....	106,376	20,347	126,723	126,723	
80,873	12,132	93,005	.....	.....	94,467	13,129	107,596	107,596	
49	49	1,169	1,169	1,169	17,703	409	18,112	18,112	
678	678	987	1,210	2,197	27,307	4,945	32,252	32,252	Nebraska ⁵
150	150	482	482	482	25,942	3,365	29,307	29,307	
		559	559	613	19,569	2,898	22,467	22,467	
		129	129	129	1,284	47	1,331	1,331	N. Dakota
		410	410	410	1,465	96	1,560	1,560	
		144	144	144	1,093	.....	1,093	1,093	
241	241	1,869	1,869	1,869	17,746	900	18,646	18,646	
50	50	1,170	94	1,264	9,603	479	10,082	10,082	S. Dakota
		778	778	778	5,817	325	6,142	6,142	
		250	540	790	4,110	637	4,747	4,747	
15,297	16,838	32,135	22,145	8,985	31,130	441,268	332,493	773,761	
6,721	302	7,023	22,002	9,288	31,290	316,586	204,069	520,655	
10,848	1,345	12,193	13,683	4,980	18,663	300,843	217,269	518,112	
4,503	2,112	6,615	10,518	6,536	17,054	254,614	201,343	455,957	
159,583	3,175	162,758	7,333	8,818	16,151	179,288	23,844	203,132	
156,217	156,217	152	152	152	157,431	343	157,774	157,774	Other States
183,150	183,150	139	100	239	184,160	100	184,260	184,260	
212,093	3,984	216,077	3,168	958	4,126	215,658	5,624	221,282	
1,179,924	241,473	1,421,397	1,329,474	388,706	1,718,180	10,378,167	4,171,127	14,549,234	
1,218,073	301,196	1,519,269	1,257,428	506,939	1,764,367	8,461,915	4,217,857	12,679,772	Totals
1,788,233	419,530	2,207,763	1,419,795	545,133	1,964,928	8,111,034	4,735,149	12,846,183	
1,949,568	473,243	2,422,811	1,330,842	608,026	1,938,868	7,911,979	5,015,122	12,927,101	

(4) Exclusive of shipments to Atchison and Leavenworth.

(5) Includes tonnage to East St. Louis, Ill. and Atchison and Leavenworth, Kan.

(6) Includes shipments to Council Bluffs, Ia.

* Coal passing through a 2-in. screen.

MECHANICAL LOADING

Revolutionize

An Old Mine

By Paul Weir and J. H. Edwards

*General Superintendent
Bell & Zoller Coal & Mining Co.*

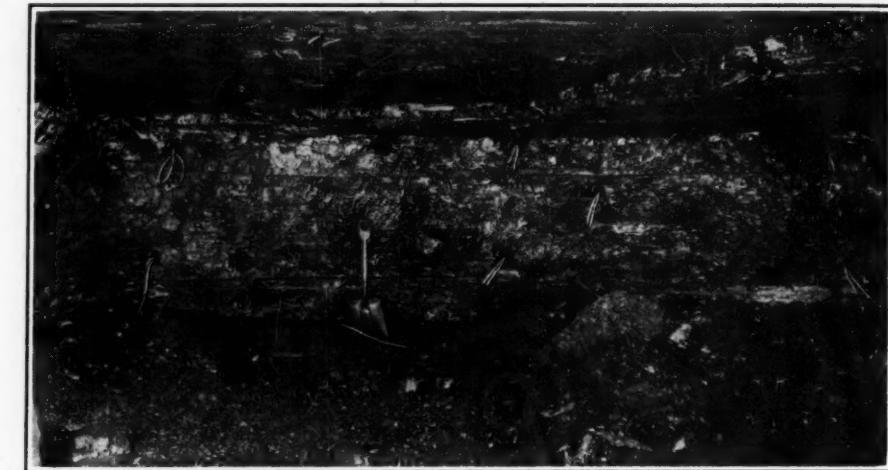
*Associate Editor,
Coal Age*

MOST of the completely mechanized mines changed from hand loading gradually. Operators necessarily felt their way cautiously, making initial installations of one or perhaps two or three machines of a type. But persistent experimenting and the accumulation and interchange of data seem to have brought the art of mechanization to a point where it is safe to plan and execute a complete change at one stroke.

This was the case at Mine No. 5 of the Centralia Coal Co., a 2,000-ton Bell & Zoller operation at Centralia, Ill. On Nov. 1, last, hand loading was stopped and Joy machines put into use. By the end of January the average production per machine had been brought to 233 tons per 8-hour shift. Successive increases brought the February average to 243 tons and the March average to 258 tons.

This unit production, after but a few months of operation, already is close to the top for Illinois and Indiana mines, and yet it was made with cars of only 2.6 tons capacity, which is smaller than those being used by most of the other mechanized mines.

An interesting feature in connection with the mechanization is the extensive use of Cardox, the carbon-dioxide bomb for bringing down the coal. This gas-expansion method



Seven Holes Loaded With Cardox Shells

permits shooting while the full crew is in the mine, whereas the Illinois mining regulations prohibit shooting with ordinary explosives during the shift.

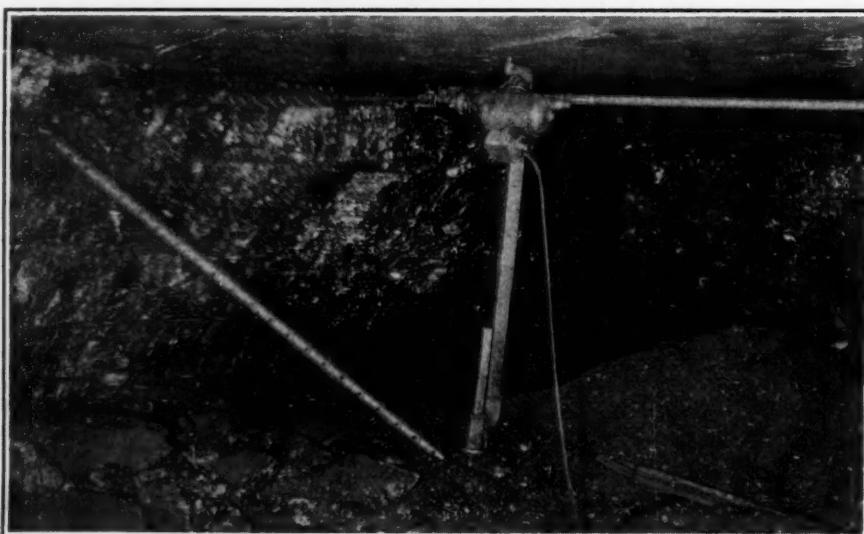
The mine is in the No. 6 seam,

which lies nearly level and under 550 ft. of cover. The thickness of the bed is 6 to 8 ft., and about 14 in. from the bottom occurs a slate parting known as the blue band. For the most part the coal is topped by 18 in. to 2 ft. of black slate. In some places there is an inch or so of drawslate and in other places the top is limestone. The bottom is a 4-ft. vein of hard fireclay. Absence of water and explosive gas are two conditions of favor.

For mechanical loading no change was made in the general system followed since the mine was opened about 18 years ago. The coal is taken by driving 28-ft. rooms on 50-ft. centers and leaving the pillars. In places steel ties are used to obtain sufficient height for the loading machines.

Undercutting equipment used in connection with the Joy loaders consists of four Jeffrey 35BB mining machines and one Goodman Universal, all equipped with 8½-ft. cutter bars. Three breast machines are used

Core Type Drill Sinking 4-in. Holes



and CARDOX



Joy Machine Loading In a 28-Ft. Room

on development along with an equal number of Jeffrey pit-car loaders.

Each loading machine is served by a 5-ton or a 6-ton Goodman locomotive having an automatic cable reel. In certain sections a locomotive termed a "swing motor" handles the cars from two loading-machine partings to a parting on the main haul. Any extra time that these swing motors have is spent gathering cars into which machine cuttings have been loaded by hand.

Facilities for quick car changing in rooms consists of side tracks in 45-deg. crosscuts. Every third room serves as a haulway for that room and for the ones on each side. Tracks are taken up in the two flanking rooms as track is laid in the new crosscuts. Eighty to 90 ft. is the maximum haul for the gathering locomotives in making a car change.

The track is located in the center of the room and a row of props carried on each side. The prop line is "fanned out" at the face—that is, the closest props are set outside of the line, then moved to the permanent location as soon as the next face props are set. If a bad fall occurs at the face of a room it is not cleaned up but instead the face is picked up by driving another 45-deg. crosscut from the haulage room.

As is the practice in several other Illinois mines, the face is snubbed at the blue band and the refuse thrown

to one side before the main body of coal is shot down. The snubbing shots as well as the others are "pulled" with Cardox. The method of handling this will be described after a few words concerning the loading machine crew and the working cycle.

Sixteen men normally do the work for a loading machine on a pair of entries and the dependent rooms, and

they all work on the same shift. As is the usual practice, two men handle the loading machine and two the gathering locomotive. Following the loading machine come two clean-up men who square up the corners and scrap the bottom—that is, take up the coal left below the undercut. They load approximately three tons per room.

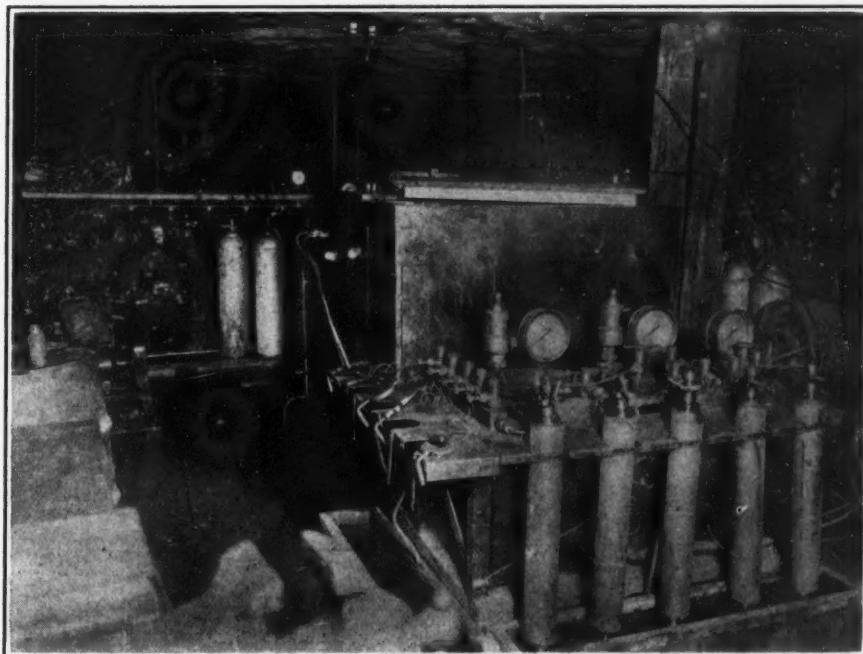
Following a crew of two men doing the undercutting come a driller and a dust shoveler. The latter helps the driller set the electric drill, then shovels out and loads the dust from the undercut. The drill is transported on a light-weight truck which the men push easily.

A shooter and two snubbers follow. One of the snubbers assists the shooter in putting the Cardox shells into the holes, tamping to a length of about 2 ft., and firing the snubbing shots, which are placed just above the blue band. The snubbers then pull out and leave in front of the face the foot or so of coal that has been shot down, and throw aside the parting. Next the main shots are fired, thus completing the cycle.

Timbering is handled by one man, and the track work by two men.

Shooting the coal with Cardox, in so far as safety and effect are concerned, presumably is somewhat as if a miniature high-pressure steam boiler were exploded in the back of the drillhole. A steel tube about 4 in. in diameter and 39 in. long, known as the Cardox shell, is the "boiler," but instead of being charged

Left to Right: Header and Supply Drums, Cooling Box, Charging Rack and Carbon-Dioxide Compressor



with water it is charged with carbon dioxide. Its weight is 71 lb. empty, and 75 lb. charged.

Instead of allowing the shell to be destroyed by the explosion, a weak point which is a renewable shearing disk is provided. Heat to generate the explosion pressure is applied after the shell has been tamped in the hole. This heat results from chemical action of a cartridge about 1 in. in diameter and 20 in. long which is surrounded by and is in direct contact with the carbon dioxide.

The chemical action is started by the blowing of a 90-amp. electric fuse that is embedded in the center of the heating element. Only about $\frac{1}{10}$ of a second elapses between blowing of the fuse and rupturing of the "boiler" disk.

In the No. 5 mine electric current for blowing the fuse which fires the shell is obtained by connecting the shell terminal bolts to the 275-volt d.c. power system through a suitable control switch. Because nearly 100 amp. is required to blow the fuse, there seems to be no chance of premature firing by stray currents of the usual magnitudes.

The shotholes are drilled 4 in. in diameter by means of a Chicago Pneumatic Tool Co.'s type 474 drill and a type 900 mounting. The drill rods are core type with renewable "Stellite" cutter heads. In a 28-ft. room seven holes are drilled from three settings. These holes include the three snubbing holes just above the blue band, three holes close to the top and a buster hole just to one side of the center top hole but about 15 in. lower. In sinking a hole to the back of the undercut 3-ft., 6-ft., and



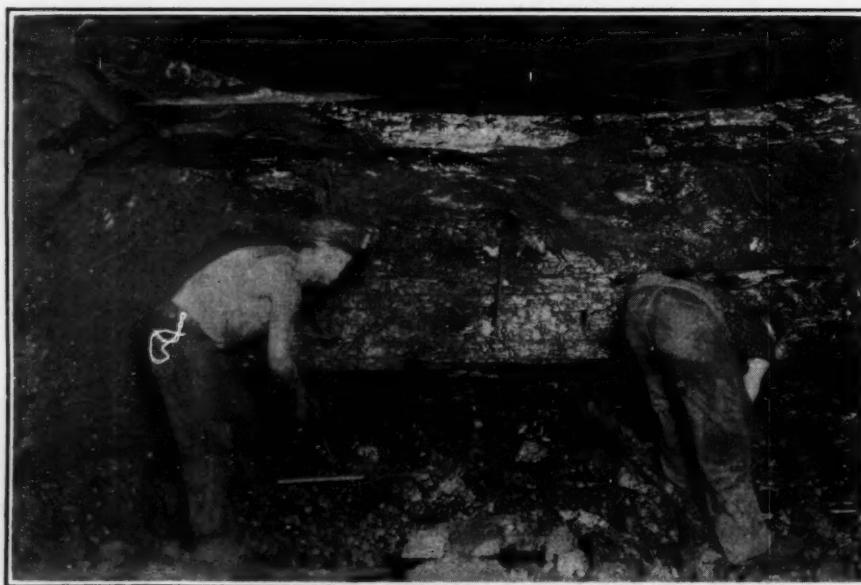
View of Charging Room

8-ft. core barrels are used successively.

Exploded shells are recharged in an underground station consisting of a single room 18 ft. wide and 30 ft. long. The principal items of equipment are: a refrigerating machine driven by a 1½-hp. motor, a 10-hp. two-stage carbon-dioxide compressor, cooling tank in which copper coils carrying carbon dioxide are immersed in a cooling brine, header to which twenty gas supply drums can be attached and a charging rack accommodating ten shells at a time. The rated capacity of the station is 30 shells per hour.

The carbon dioxide is purchased in standard 150-lb. tanks. Procedure in the charging station consists of unscrewing the shell caps, cleaning out the remains of the old fuse and heating element, inserting new ones, sealing the shells by screwing the caps down onto the new shearing disks, then placing on the charging rack where the compressor fills the shell with carbon dioxide to a pressure of 2,500 lb. per square inch.

Snubbing a Room Neck Shot With Cardox



Charging is done by two men who start work at 5 p.m. During the day the empty shells have been assembled at the charging station. The men put in the full shift charging the 125 shells, which is the extent of the present equipment; though they could charge nearly twice as many shells during the eight hours.

A night-delivery locomotive takes the loaded shells along with general supplies and stores them at the bit stations at each pair of panels. The shooter, working during the day shift, puts seven loaded shells on a light truck which he pushes to the room to be shot. After firing he brings back the seven empties, excepting possibly any that might be buried in the coal. These the loaders find and sent to the charging station on top of the loaded cars.

The mine is producing 1,700 tons. Under hand loading production was 3,000 tons. At that time the picking-table force consisted of four men. Now with mechanical loading eight men are required.

The total working force for a production of 1,738 tons with six Joy machines was 152 men underground, including both day and night men, and 27 men above ground. Several of these top men are employed in the mine power plant.

Stripping Brings New Life

(Continued from page 281)

For drainage equipment we have standardized on Dayton-Dowd direct-connected centrifugal pumps with 440-volt Westinghouse motors. They are in three sizes—6x8, 3x4 and 1½x2. They are all mounted on portable skids with small protecting housings built over the motor and pump. Rubber discharge and suction hose with foot valves or strainers is used. Spiral pipe both on the suction and discharge is installed when the pumps are permanently placed.

The first pit is now completed and producing coal, the second pit with two new stripping units will be opened this summer. The equipment for the latter will consist of one 10-yd. dragline and a 12-yd. shovel and other coal loading and pit machinery. The tipple has a capacity of 75,000 to 80,000 tons per month, so can take care of the two pits and possibly of a smaller single-stripper pit. All construction and the pit and development work except the drilling and ditching, has been done since Oct. 15, 1927. Coal production was started on March 15, 1928.

Ohio Section, A.I.M.E.

Digs Into

MECHANICAL MINING

VARIETY marked the April meeting of the Ohio Section, A.I.M.E., in Columbus, Ohio, April 21. Plant visits, motion pictures of mechanical loaders, formal papers and informal discussion on mine mechanization occupied guests of the section throughout the day. A banquet at the Faculty Club of Ohio State University at 7 p.m. furnished an opportunity to hear James B. Pauley, chairman of the board, Miami Coal Co., Chicago, Ill.; Harry L. Gandy, executive secretary, National Coal Association, Washington, D. C., and Dr. H. Foster Bain, secretary, American Institute of Mining and Metallurgical Engineers, New York. Col. F. B. Richards, chairman, Hanna Furnace Co., Cleveland, Ohio, and chairman of the Ohio Section of the A.I.M.E., was toastmaster.

In spite of heavy rain, engineers and operators came from Kentucky, Illinois, West Virginia and Pennsylvania, as well as from various parts of Ohio. The morning was devoted to a visit to the works of the International Derrick & Equipment Co. and of the Jeffrey Manufacturing Co., both of Columbus. In the latter plant interest was centered in mining machinery in process of construction.

Following a luncheon for the members and guests of the Ohio Section, served in the Jeffrey cafeteria, W. J. Shearer of the British Jeffrey Diamond Co., described modern coal-mining practice in Great Britain, setting forth reasons for special practices adopted there which are not required by conditions in the United States. After comparing production costs for 1922—the last year for which he had official figures in both countries, in which f.o.b. mine costs in Britain averaged \$4.38 and in the United States \$3.04—Mr. Shearer said:

WHEREAS 90 per cent of American coal is taken at an average depth of less than 600 ft., much English coal is now mined below 2,000 ft. and some below 3,000 ft. This great depth accounts for much of the longwall work. Roof pressure precludes room-and-pillar be-

cause of crushing under this weight.

"Ventilation, too," said Mr. Shearer, "is affected. Whereas you use air to dilute gases, we in Britain use it to cool the rock as well. At great depths temperatures vary from 90 to 104 deg. F. Without a greatly increased volume of air men cannot endure this. Pumping and hoisting costs become a serious item at these depths. At Harworth colliery, for instance, one pump has a lift of over 3,000 ft.

"The deeper the coal, the greater the shaft cost, and consequently the

markets. That low wages make low costs appears to be fallacious, however, when we realize that for an average wage of \$2.50 per day we get an average production of only 1.17 tons. British mine inspectors are not political appointees and, therefore, feel more secure and are not responsive to political pressure. Timbering frequently is required unnecessarily and at great expense. The use of electrical equipment also is greatly restricted. The district inspector has power to prevent its use altogether in certain cases. He may fence off an area in which 2½ per cent of gas is found, and no road having ½ per cent of gas may be used for haulage. These are excellent safety measures. I merely mention them to make a comparison of our conditions and your own."

Before closing Mr. Shearer mentioned other factors that affect costs

Mechanical Mining Makes Good

- (1) There are a number of machines which will successfully load coal as fast as it can be taken from them.
- (2) Objections relative to undue breakage have been overcome in a reasonable degree.
- (3) The cost of upkeep and depreciation in cents per ton is reasonable.
- (4) The cleaning feature can be handled; some of the cleaning always has been done on top in the light of day, and if necessary to do portion of it at that point why not equip to do the entire job there better and more economically than it can be done elsewhere?
- (5) Substantial reductions in cost have been demonstrated and further reductions as a result of improvements are now in sight.

Statement by James B. Pauley, chairman of board, Miami Coal Co., at banquet of Ohio Section, A.I.M.E., held at Columbus, Ohio, April 21.

greater the coal area that must be worked from each opening. This increases the haulage costs as the mine ages and lengthens the life of the mine, so that equipment becomes obsolete and thus a vicious circle of costs is started.

LACK of machinery in British mines," continued Mr. Shearer, "is due partly to legislative restrictions and partly to low wages. Before the war Britain had pretty much her own way in the Continental coal

mines. Certain leases make it impractical to take as much coal as possible. Others require payment of royalty for all coal irrespective of recovery. For small bituminous coal there is little sale. Much of it is wasted. This accounts in a measure for the present interest there in cleaning methods and in coal processing.

The very difficulty of these conditions, however, contribute to their improvement. This has led to greater

(Turn to page 308)

R. Y. WILLIAMS *discusses*

ROOF CONTROL

At Philadelphia Meeting

ROOM-AND-PILLAR workings are inefficient and costly and all modifications undesirable except longwall with steel jacks, declared R. Y. Williams, consulting engineer, Pottsville, Pa., at the meeting of the materials handling committee of the American Society of Mechanical Engineers in Philadelphia, Pa., April 24. This meeting was sponsored also by the American Institute of Mining and Metallurgical Engineers and the Engineers' Club of Philadelphia.

In the United States, Mr. Williams pointed out, fully 98 per cent of the coal obtained from underground operations is mined from rooms and pillars. Under this system "labor" is the greatest single item in the total cost of the coal f.o.b. railroad cars. For each labor dollar in an average bituminous mine 85c. is paid for work done inbye the gathering turnouts. In an average anthracite mine the corresponding figure is 70c.

During the past 10 years the chief economies in the coal industry have been obtained by complete mechanization of that portion of the work which lies outbye the gathering turnouts. But these improvements, while gratifying in their resulting economies, apply only to 15 to 30 per cent of the important cost items.

FOUR years ago Weston Dodson & Co., Inc., determined to have an exhaustive study made of complete face mechanization in order that its operations might be based on correct underlying principles. The result of that study, which was made by Mr. Williams, led to the adoption of a method of longwall mining wherein the roof is worked on the caving system and is supported as an overhang along the face by steel jacks.

A careful analysis of the room-and-pillar method was made. From partial data at hand, the number of working places in flat room-and-pillar mines per 100 tons output per day varies greatly, but averages around twenty. A mine producing 1,000 tons per day would therefore require 200 rooms. This adds greatly to the costs of supervising and ventilation.

In a mine designed for room-and-

pillar operating the percentage of the daily production from development is about 45 per cent of the whole and from rooms proper it is 55. If pillars are later robbed, and if the recovery is complete, 25 per cent of the coal produced from a given area will come from development work and 75 per cent from rooms and pillars.

The miner usually is paid a yardage rate for this development to compensate him for the additional difficulty he must meet in winning only half as much coal between his two tight ribs as the room miner wins. In any mine where, say, \$2 per yard is paid in development work over room work, the foreman, if you asked him, would say he paid no yardage in rooms. In a sense that answer would be misleading because the two tight corners in a room are as tight as the two in a heading.

IN THIS case, Mr. Williams declared, the work of the miner in cleaning out the two tight ribs of a room is included in the tonnage rate and actually the yardage rate of \$2 in the heading is a payment additional to that already paid in the tonnage rate for the two tight corners. All mining under this room-and-pillar system really is narrow work.

Stop-watch studies indicate an average undercutting efficiency in room-and-pillar mines of only 20 per cent. The cutter and the scraper work harder when the machine is not cutting than when it is doing the task for which it was designed. With concentration of working faces, improvement in transfer-truck design, widened room faces and perfect co-ordination, the efficiency may be raised to 33 per cent.

Similar studies of average loading-machine operations, said Mr. Williams, indicate as low a percentage of performance. Gathering equipment also has a low efficiency. An elaborate network of tracks must be installed and maintained between the inbye gathering partings and the 200 working faces per 1,000 tons of daily production. Furthermore, a large number of haulage locomotives (or mules) and cars must be provided to

make it possible to "spot," one at a time, three to six empty mine cars daily at each face and to gather these cars one at a time when loaded. This means 1,200 to 2,400 car-spotting operations per 1,000 tons of daily production. Moreover, with room-and-pillar mining recovery is seldom complete, and where in addition mechanical methods are employed, complete recovery of coal is not possible. Assuming that the property, plant, development and equipment cost of coal in place is \$1 a ton under 100-per cent recovery, under 70 per cent extraction it would cost \$1.43 per ton, a loss of 43c. per ton chargeable to the inefficiency of the mining method.

Both size and purity are affected by the system of mining. Where the coal is mined from rooms it is locked in by floor, roof, back and two ribs—five of the six sides are tight until a kerf is cut in the coal, as is the practice in bituminous mines though exceptional in anthracite.

THE unlocking of this coal by explosives without close supervision and with the miner anxious to produce a large quantity of coal regardless of size results in the production of junior sizes. Investigation would show that the miner charges a high price for cleaning his coal when his tonnage rates are being determined and does the work far less efficiently and more expensively than the cheaper daylight worker.

To rectify the defects of room-and-pillar method many experiments in lengthening faces have been made, but no attempt has been made to create an ideal toward which to work. Some of the suggestions made are: (1) Each face should be just long enough for an undercutting machine operating continuously to cut the face in one shift of 8 hours. This length would vary from 300 to 500 ft. (2) Each face should be cut to just such a depth that a loading machine operating continuously will load the coal in a shift. That is, the cut should be on an average $6\frac{1}{2}$ ft. deep. (3) Each face should be capable of being held open in front of the face for a width sufficient to accommodate the roof-control mechanism, to permit the operation of the cutting machine and to provide space for a conveyor large enough to transport all the coal from the face to trains of mine cars in one shift of 8 hours. The width of the entire space will average $10\frac{1}{2}$ ft. (4) The roof-control elements should be such that they can be completely re-

adjusted in a single shift of 8 hours to the daily advance of the face, and they also should be capable of holding the roof indefinitely without attention during an idle period.

IT WILL be well here to compare the room-and-pillar method with the system outlined.

(1) With rooms and pillars 200 rooms must be maintained for a daily production of 1,000 tons. A perfect longwall would require on an average only three faces. Inspection instead of being operative only 10 minutes in every 8 hours will be continuous.

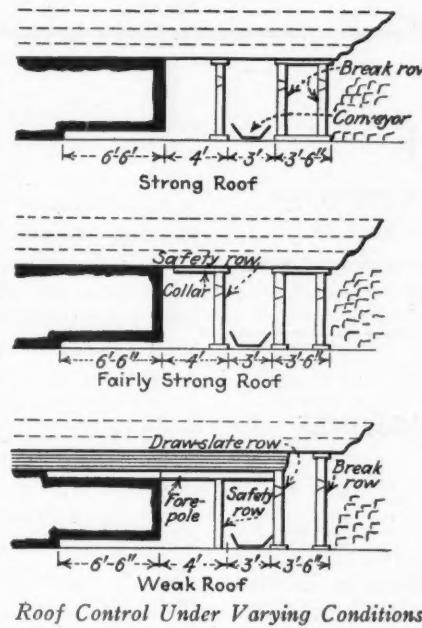
(2) Instead of 225-hp. motor being needed to drive the fan, one of 25 hp. will furnish air for the same tonnage and four times as much air will be provided.

(3) Though it is proposed to drive all haulage roads in solid coal rather than through packwalls in the gob, nevertheless (a) the proportion of total production from narrow headings and aircourses will vary from 6 to 12 per cent, whereas under room-and-pillar methods the corresponding proportion varies from 25 to 45 per cent, and (b) under longwall the remaining 88 to 94 per cent comes from faces 300 to 500 ft. long without any rib anywhere, whereas under the room-and-pillar method the remaining 55 to 75 per cent comes from room faces which are only less narrow than the heading faces, each face being locked in by two ribs.

Room-and-pillar provides an average efficiency of 20 per cent for cutting, loading and haulage machinery with 33 per cent as a maximum, whereas the perfect longwall face should have an efficiency of over 80 per cent or should triple the production per machine. Complete mechanization covering cutting, loading and gathering haulage could be installed under longwall for one-third the cost of that under room-and-pillar for the same tonnage.

As longwall permits complete recovery, the cost per ton for fixed charges and development will, in general, be much lower than with room-and-pillar, which seldom gives complete recovery and then only at a high cost for the "last" tons recovered.

THE absence of the necessity for heavy rib shots in long-wall to clean out tight corners greatly reduces the breakage caused by explosives when that system is used. Because supervision in longwall is efficient whatever blasting procedure has been found best will be used in practice.



Roof Control Under Varying Conditions

At one bituminous mine the value of the product was increased 22 per cent by an increase of 14 $\frac{2}{3}$ per cent in the proportion of lump over the former room-and-pillar system.

Longwall roof control, said Mr. Williams, is obtained either by packwalls or by caving. With packwalls no explosives are required because the roof in settling breaks down the coal; the resulting product is of good size; all the coal is recovered; damage to the surface is at a minimum, and with longwall advancing no development is needed.

THE disadvantages, which more than offset these favorable aspects, are: Most of the work of obtaining material for packwalls and all of the tedious work of constructing them must be done by hand; packwalling usually is adaptable only to thin beds; it operates best only under certain kinds of shale roof; it limits the width that can be left between the face and the walls so greatly as barely to accommodate the kerf cutting machine; because of the lack of width a conveyor is used with difficulty and it is still more difficult to use a loading machine; the undercut is necessarily shallow, not over 3 to 4 ft.; the daily tonnage per foot of face is small, the labor cost per ton is high and the keeping of haulageways "brushed" to afford height is expensive. High cost, low tonnage per employee and unsuitability for complete mechanization have ruled out the use of packwalls on longwall faces.

In using a caving system artificial supports are placed along the face at a distance sufficiently wide to permit men and machines to operate.

These supports are removed as the face advances and new supports are placed. The roof is expected to cave behind the timber. With all forms of timber supports the difficulty arises that the results are not uniform and faces frequently are lost.

When props are used in caving systems they can be removed by post pullers during the first 40 to 60 ft. of advance. Thereafter they have to be cut or blasted out, the former practice being undesirable and in most states illegal. Props can be used only once and the consumption of timber usually is more than double that with room-and-pillar mining.

Cogs are found to be easily compressible; consequently the roof weight keeps creeping toward the face, thereby reducing the depth to which the coal can be undercut, sometimes causing the immediate roof to break and fall in slabs where men and machines are working.

To meet these difficulties a longface layout sometimes has been adopted, the face being stopped after an advance to a point slightly less than the distance at which experience in that particular mine has shown that roof failures will occur, which usually is less than 100 ft. A pillar of 15 to 30 ft. is then left along the entire length of face and a longface started on the other side of the pillar in a narrow room driven for that purpose. With this method time is lost removing the equipment and reinstalling it; expense is incurred in driving the room, production is delayed and a large pillar of coal is lost.

ANOTHER plan is to limit the length of the longface. It is contended that if an advance of a little less than 100 ft. can safely be made with a 400-ft. face, a longer advance can be made with a shorter face. This saves some of the costs enumerated other than room driving, but in comparison with our ideas of a perfect longwall face greatly limits the efficiency of machinery, ventilation and supervision and more than doubles the required development.

A third modification is the introduction of the "step system" whereby several faces, each usually somewhat less than 100 ft. long, are driven simultaneously in retreat and each face is stepped somewhat less than 100 ft. ahead of the neighboring face at one end and an equal distance behind the neighboring face at the other. The disadvantages of this

(Turn to page 305)

COAL AGE

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JOHN M. CARMODY, Editor

NEW YORK, MAY, 1928

Bringing mining operations to the light of day

NOT in the Paris (Ark.) field only is the scow system described in this issue applicable. In the anthracite region of Pennsylvania it will be welcome news that coal can be extracted in large ton masses and brought to the surface. The trouble with thin coal has been that it is necessary to shoot it hard, but the Paris coal is thin and it has been found possible to extract it without shooting it at all. When the coal is brought out with its layers of impurity unbroken it will be possible by air hammers to split it so as to remove the dirty layers, leaving the coal clean.

Hitherto by an excessive use of powder what Nature had segregated has been mixed with the clean product, making hand cleaning difficult. In the bed there is what approaches an orderly arrangement but on the floor after the shooting, coal, bone, pyrite and slate are often mixed heterogeneously, to be further commingled in shoveling into the car.

The whole method at the Beatty mine is revolutionary. To change a big operation to accord with it would mean a tremendous scrapping of equipment, but where coal is thin and operations are new it would be well to make trial of its possibilities. It transfers to the surface many of the operations of mining that are done under the severest handicaps in thin seams with bad light.

Back to fundamentals?

WHEN the Senate committee on interstate commerce started its inquiry into conditions in the bituminous coal fields of Ohio, Pennsylvania and West Virginia there was a disposition in many quarters to accept Senator Couzens' "hippodrome" characterization of a subcommittee trip to the mining regions as a pat description of the committee's activities. That the committee has not deliberately shunned the spectacular—particularly in some of its earlier sessions—may be admitted. The Senators are dealing with a situation which readily lends itself to dramatic treatment, and who shall insinuate that Capitol Hill does not appreciate "good theater"?

Happily the stage of turgid dramaturgy appears to be passing and now the spotlight is being turned upon cold economic facts. The review of a brutal

civil war is yielding place to a consideration of the causes back of that war. The "conspiracy" to crush the union and labor's "plot" to enslave the free sons of the Southern mountains both are moving into a truer perspective. Most of the human evils which have darkened the pages of coal history in recent years have not been the fruits of innate wickedness but of economic pressure. Why is a basic industry such as coal so low in the profit scale of business? That is the question now coming to the fore.

For this reason it is fortunate that counsel for Southern operators and members of the committee have abandoned their wordy war over the power of the committee to demand information with respect to costs, prices and sales of producing companies. Regardless of any legal justification which may or may not exist for the opposition to revealing private information of this character, such opposition puts the industry in an unfavorable public light. The way is now open for a needed economic survey which will enlighten Congress, the public and the coal industry itself.

Where were safety boards when ribs were first drawn?

NO EASY PATH is that which the U. S. Bureau of Mines and the state departments have to follow. They must be careful, on the one hand, not to stifle development, and yet it is their duty to promote safety. The nature of their problem is best seen in the light of mining history.

Many years ago rooms, or, as they were then termed, "bords," were driven, leaving pillars between them. It was considered dangerous to remove the pillars, so much so that the word "robbing" was invented to suggest, it may be supposed, something surreptitious in the removal.

But pillarizing is nevertheless almost general and where operators did not withdraw pillars the United States Coal Commission censured them, the U. S. Bureau of Mines has questioned their practice and in general they have found themselves subjected to criticism, and indeed it has never been the question as to the safety of pillar drawing that has caused them to leave coal behind them.

Supposing, however, some safety authority had been empowered at that early day when pillarizing was not practiced to decide whether pillars should be drawn or left in the ground. Probably not a pillar but would have been left there till today—crushed, no doubt, but not removed.

Longwall seemed even worse than pillarizing. It appeared to be flirting with death. What opposition might it not have received in Europe if a good active department of safety had been on the job. Many a man has commenced it in America with cribs, chocks and walls galore, after early British models which were generous in the use of such

material, and yet has given up longwall as unsafe. Yet longwall is general in Europe and its life loss per man is about a fourth of ours.

These earlier conditions are recited to show that what is safe and what is unsafe is not as obvious as some may think. Study, observation, statistics, an open mind, tolerance and patience are needed lest progress be stopped and even in some case safety itself be jeopardized.

Teamwork

IN ITS announcement of its sixteenth annual meeting to be held in Washington, D. C., May 7-11, the Chamber of Commerce of the United States says: "The men who attend this meeting are not concerned alone with particular businesses. They are meeting to learn more about the problems of *all* business—to learn about their relation to the social and economic development of America." Elsewhere the announcement states: "Business as a whole is much more progressive than the individual business man."

In these statements lies a broad challenge to leaders of American business to lay the groundwork for broad policies that will eliminate waste from industry. Not the least important problem in our business structure is that of unemployment. Much has been said about it. Altogether too little is known about its real extent or its actual effect on general prosperity.

Its causes, however, are better understood day by day. For one thing productive capacity tends to outstrip ability to consume. The channels of trade are not sufficiently wide open. This applies to domestic as well as foreign commerce. We know now that basic industries, coal among them, can prosper only as the country's entire citizenship maintains its purchasing power.

With this in mind and its attention already directed to the close relationship between our social and economic development, the Chamber is in a strategic position to focus the attention of its members on something more than pleasant generalities.

Pennsylvania ventilation law no universal precedent

IN ITS announcement of its sixteenth annual meeting to be held in Washington, D. C., May 7-11, the Chamber of Commerce of the United States says: "The men who attend this meeting are not concerned alone with particular businesses. They are meeting to learn more about the problems of *all* business—to learn about their relation to the social and economic development of America." Elsewhere the announcement states: "Business as a whole is much more progressive than the individual business man."

vided, may be so befouled by expired gas or so depleted of oxygen that it will not support combustion and even be extinctive of life.

In planning such mines it is of immense importance to limit the distance air is carried past bodies of coal which not only create carbon dioxide but rob the air of oxygen.

Good air is a profitable investment, especially in mines where carbon dioxide is prevalent and fungus has or is likely to spread. Mines have notably declined in their production of fungus. Rarely does one see today festoons of fungus hanging from timbers. They were common sights in earlier days. This change is due to better ventilation and purer air. The unfortunate situation is that the return air, which will support fungus growth, often travels along roads where the introduction and erection of new timber are expensive. Consequently plenty of air and air not unduly exposed to corruption should be provided.

At issue

BY ITS DECISION enjoining the Interstate Commerce Commission's order prohibiting a reduction in the rates on lake-cargo coal from the Southern fields the United States Circuit Court has directed attention anew to the tremendous byproducts of regulation. The Interstate Commerce Commission, of course, is limited in its power to control over the rates and practices of common carriers. Yet the exercise of that control, as the court points out, may mean the economic life, not of the railroads, but of private industries.

There is, of course, nothing new in this power. Formerly it resided in the railroads, where it sometimes was exercised in beneficent tyranny to build up the commerce of an undeveloped section of the country or to nurse a weakling industry into strength. "The power to tax is the power to destroy"—and there is much in common between the imposition of taxes and the imposition of freight charges. The cardinal difference between the private and the public exercise of that power is that under public exercise the individual stands less chance of enlisting allies to defeat the official ukase. It is difficult to see, however, how this may be avoided.

Under these circumstances it seems essential that the limits of the exercise of this authority should be carefully marked out. Statement and restatement of the fields of private action and public limitations ought to be made that the governed and the governing know definitely what may and what may not be done. The decision of the lower court, which will reach the Supreme Court of the United States in due course and in keeping with the orderly processes of law, offers a much-needed opportunity for sign-posting the road upon which we are traveling in regulation.

NOTES

From Across the Sea

THOUGH the miner is relatively free from the hazard of contracting disease in the mines it appears that in the British Isles some diseases are being definitely traced to subsurface infection. This may be due to the depth of the mines and to the fact that their heat creates conditions favorable to the development of infective organisms.

A report on spirochaetal jaundice among Scotch coal miners was published recently by the British Medical Research Council. The cases among miners were found in wet mines and were similar to those found among mine workers in Japan in 1915. Soldiers during the war, especially those in the trenches, developed a similar disease. It appears from reports to occur in all parts of the world.

Rats are believed to be the carriers of this disease. A strain of the organism capable of producing the symptoms has been found in the roof slime of a mine in which cases of the infectious jaundice had occurred. An anti-spirochaetal serum, used during the war, has been found effective in the Scottish mines. The Research Council recommends the extermination of rats and the drainage of the working places.

A report has just been made by Henry Walker, Great Britain's chief inspector, on the explosion which occurred at the Marine Colliery in Monmouthshire March 1 of last year. Many reasons for the explosion were advanced at the inquiry, but opinion varied as to its origin and cause. Mr. Walker says that a compressed-air blower, "having regard to its position, was insufficient to dilute and render harmless flammable gas coming from a fall when the work of recovering the conveyor engine buried in that fall was in progress."

HERE is the interesting part of the statement. He says that the mixture of air and gas was ignited either by the falling of rocks on rocks which had already fallen, or by the bare glowing filament of an electric light which it has been impossible to find. Coal dust, he adds, increased the area covered by the explosion and intensified its violence.

Dr. R. Lessing, who about two years ago was a most welcome guest of the International Bituminous Coal Conference and who explained there the influence of catalysts upon coking in a most telling manner, has been discussing the value of "Clean Coal in the Coking Industry" before the Coke Oven Managers' Association at Newcastle-on-Tyne, England. "Not so many years ago," said Dr. Lessing, "some blast-furnace managers still considered ash as

desirable in coke." Coke workers are agreed today, according to the same authority, that ash is undesirable because it reduces the coke's hardness and resistance to abrasion, lowers the fixed carbon in the fuel and hence the available heat in the hearth and because it necessitates the use of additional fuel and limestone for melting.

Said Dr. Lessing: "The decrease in the value per ton of coal was assessed by E. H. Lewis to be approximately 18.8c. for each per cent of ash below a standard of 5 per cent." Dr. Lessing also quoted E. S. Gill to the effect that every 3 per cent reduction in the content of ash saves 30c. per ton of pig iron made, remarking that he believed that the figure was, if anything, too low. By washing, the silica, alumina and iron are reduced more considerably than the rest of the ash and with the iron goes also the sulphur.

"The entire removal of the 'dirt' silica (by which it may be assumed he means the extraneous silica) not only makes it possible to dispense with an equivalent quantity of limestone in the furnace burden, but also has a more positive effect, for it so happens that the ash from the clean coal portion consists of low-melting compounds, which in themselves exert a fluxing action, and when no longer neutralized by the silica, they replace an equivalent quantity of limestone.

"The value of a coke containing only 3 or 4 per cent of such low melting ash may be gaged from the fact that in a blast-furnace charge the silica and alumina in coke may be equal to 50 or more per cent of the quantity of these compounds in the corresponding quantity of iron ore."

From Paris comes news that the French state-owned mines in the Sarre have installed new washing plants, enabling the mines gradually to decrease their sales of untreated coal and to continue research work with regard to semi-coke. It is stated that investigations in this field indicate that industrial production is not far distant.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

"Coal Stripping Possibilities in Southern and Southwestern Illinois," by G. H. Cady; 55 pp., octavo; Illinois Mining Investigations, State Geological Survey, Urbana, Ill.

Wherever coal crops at a low gradient in ground almost level abundant opportunities for stripping occur. This is particularly true in St. Clair, Randolph, Perry, Williamson, Saline and Gallatin counties of southern Illinois and also in Richland, Edwards, Wabash, Fulton, Warren, Schuyler, Brown and Vermilion further to the north.

This recital shows that stripping in Illinois is likely to make further extension, though "since the summer of 1925 no additional large strip pits have been opened." However, "there has been an appreciable increase in production" and "a continued interest in stripping as a possible source of coal," as is manifested "in the large amount of exploratory work carried on." The report, as its title sets forth, does not cover any but the areas reaching from St. Clair to Gallatin county.

"Coal Carbonization, High and Low Temperature"; 406 pp., octavo; Isaac Pitman & Sons, New York City.

New developments in coal carbonization make new books advisable from time to time regardless of the number that already have been published. The number of processes described and illustrated in the book under review is unusually large. Some of these have been unsuccessful, but the author, John Roberts, of England, inserts them with the remark that it is important to know what has been tried and tried in vain so as to know what future experiment should avoid.

Declaring that the metamorphism of peat to anthracite is nothing else but carbonization in Nature's ovens, Mr. Roberts studies the origin of coal and specifically of anthracite. He then discusses why coal should be carbonized and follows with chapters on coking and non-coking coals, the coking process, pre-heating, blending and influencing factors. The rest and major portion of the book is on processing with a short chapter on producing oils from coal.



Fifth Annual Convention
Practical Coal Operating Men and
Exposition of Coal Mine
Equipment



Held in Music Hall, Cincinnati, Ohio

May 7-11, 1928

Under the Auspices of the
American Mining Congress

Program of Technical Sessions

Monday, May 7—2 p. m.

Chairman—W. L. ROBISON, Vice-President, Youghiogheny & Ohio Coal Co.

Topic: "Management and Safety Problems."

"Training and Selection of Personnel." By H. S. GILBERTSON, Director of Personnel, Lehigh Coal & Navigation Co.

"General Underground Supervision." By H. A. TREADWELL, Chief Engineer, Chicago, Wilmington & Franklin Coal Co.

"Advancement of Rock Dusting Practice." By CHAS. ENZIAN, Mining Engineer, Berwind-White Coal Mining Co., and J. E. JONES, Safety Engineer, Old Ben Coal Corporation.

"Safety Equipment to Prevent Accidents." By D. HARRINGTON, Chief Engineer, Safety Division, U. S. Bureau of Mines.

"Ventilation of Gaseous Mines." By RICHARD D. MAIZE, Mine Inspector, Uniontown, Pa. General Discussion.

Tuesday, May 8—9 a. m.

Chairman—A. C. CALLEN, Professor of Mining, University of Illinois

Topic: "Power and Transportation."

"Haulage Systems."

(a) Capacity and Design of Mine Cars. By C. E. WATTS, Mechanical Engineer, Berwind-White Coal Mining Co.

(b) Haulage System with Gathering Locomotives Only. By R. L. ADAMS, Mining Engineer, Old Ben Coal Corporation.

(c) Track Systems. By C. W. RHODES, General Manager, Fork Ridge Coal & Coke Co.

(d) Underground Transportation at Ebensburg Coal Company. By R. M. FLEMING, Engineer, Ebensburg Coal Co.

"Power." Pumping at the Philadelphia & Reading Coal & Iron Co. By J. T. JENNINGS, Power Engineer, P. & R. C. & I. Co.

Supplying Power Through Automatic Substations.

By W. C. SHUNK, General Manager, Stonge Coke & Coal Co. General Discussion.

Tuesday, May 8—2 p. m.

Chairman—E. A. HOLBROOK, Dean, School of Mines, University of Pittsburgh.

Topic: "Coal Cleaning."

"General Principles of Cleaning Coal by the Dry Cleaning Process." By THOS. FRASER, Consulting Engineer, Pittsburgh, Pa.

(a) Dry Cleaning at the Berwind-White Coal Mining Co. By E. J. NEWBAKER, General Manager, Berwind-White Coal Mining Co.

(b) Coal Cleaning at the New River & Pocahontas Consolidated Coal Co. By R. G. PERRY, Superintendent, Pocahontas Division, Berwind, W. Va.

"General Tipple Practice."

By C. P. ANDERSON, Chief Coal Inspector, New River Co. General Discussion.

Wednesday, May 9—9 a. m.

Chairman—A. B. KELLEY, General Manager, Humphreys Coal & Coke Co.

Topic: "Coal Cleaning."

"General Principles of Coal Washing." By J. B. MORROW, Consulting Engineer, Pittsburgh Coal Co.

(a) Coal Washing at the Shamokin Coal Co.

By B. C. OSLER, General Superintendent, Shamokin Coal Co.

(b) Coal Washing at American Smelting, Refining & Mining Co.

By G. P. BARTHOLOMEW, General Manager, Coal Mining Dept., American Smelting & Refining Co.

(c) Cleaning Coal at the Von Storch Colliery of South Penn Collieries Co. By THOMAS F. STEELE, Superintendent, South Penn Collieries Co.

Discussion. By ELI T. CONNER, Consulting Engineer, Scranton, Pa. General Discussion.

Wednesday, May 9—2 p. m.

Chairman—DR. L. E. YOUNG, Vice-President, Pittsburgh Coal Company.

Topic: "Development in Mechanized Mining."

"Résumé of Present Development in Mechanization." By G. B. SOUTHWARD, Mechanization Engineer, American Mining Congress.

"Mechanical Production in Coal Fields of United States." By F. G. TRYON, Statistics Division, U. S. Bureau of Mines, Washington, D. C.

"Roll Call by States to Show Present Development of Mechanized Mining and Progress Made During Past Year." Alabama ERSKINE RAMSAY
Arkansas-Oklahoma HEBER DENMAN
Colorado-New Mexico D. A. STOUT
Illinois E. E. FYKE
Indiana DAVID INGLE
Kentucky T. E. JENKINS
Maryland G. M. GILLETT
Montana H. S. HOPKA
Ohio E. J. CHRISTY
Pennsylvania:
Western N. G. ALFORD
Central C. LAW WATKINS
Tennessee R. E. HOWE
Utah OTTO HERRES
Virginia GEO. M. THORN
West Virginia:
Southern THOS. H. CLAGETT
Northern JAY I. SNODERY
Wyoming A. W. DICKINSON

General Discussion.

Thursday, May 10—9 a. m.

Chairman—J. B. Pauley, Chairman of the Board, Miami Coal Company.

Topic: "Successful Mechanized Mining Operations."

"Entry Development."

(a) With Mechanical Loaders. JEROME C. WHITE, Production Engineer, Pittsburgh Coal Co.

(b) With Shaker Loaders.

By GEO. B. PRYDE, General Manager, Union Pacific Coal Co.

(d) With Entry Drivers.

By GEO. B. HARRINGTON, President, Chicago, Wilmington & Franklin Coal Company.

"Room and Pillar Mining."

(a) Mechanical Loaders in Entries, Rooms and Pillars. By T. F. WHALEN, Superintendent, Pittsburgh & Erie Coal Co.

(b) Mechanical Loaders in Entries and Rooms. J. R. HENDERSON, General Manager, Francisco Coal Co.

(c) Conveyors in Entries, Rooms and Pillars. F. B. DUNBAR, General Superintendent, Hillman Coal and Coke Co.

General Discussion.

Thursday, May 10—2 p. m.

Chairman—EUGENE McAULIFFE, President, Union Pacific Coal Co.

Topic: "Successful Mechanized Mining Operations."

"Long Face Mining."

(a) Mechanical Loaders in Entries and Long Faces. By LEE HASKINS, General Superintendent, J. K. Dering Coal Co.

(b) Scrapers in Entries and Long Faces. W. H. SMITHERMAN, General Manager, Wet Branch Coal Co.

(c) Conveyors on Long Faces. W. C. SNYDER, General Manager, Consolidation Coal Co.

"Conveyors in Rooms, in Anthracite Mines." By W. H. LESSER, Mechanical Superintendent, Madeira, Hill & Co.

"Rock Work With Mechanical Loaders." By T. F. McCARTHY, Assistant General Superintendent, Clearfield Bituminous Coal Corporation. General Discussion.

Friday, May 11—9 a. m.

Chairman—G. M. GILLETTE, General Manager, Consolidation Coal Co.

Topic: "Cutting, Shearing, Snubbing and Blasting."

"Cutting and Shearing."

By H. F. McCULLOUGH, Director of Engineering, Consolidation Coal Co.

"Recent Developments in Drilling Equipment and Practice." By THOMAS W. GRAY, Assistant General Superintendent, and J. T. CLARK, Superintendent, Mechanical Loading, Pittsburgh Coal Co.

"The Use of the CO₂ Cartridge." By PAUL WEIR, General Superintendent, Bell & Zoller Coal & Mining Co.

"Use of Explosives in Self-Tamping Recoverable Cartridge." By STERLING S. LANIER, Jr., Vice-President, Norton Coal Mining Co.

"A Long Step Forward in Explosives." By E. E. JONES, General Manager, Lillybrook Coal Co.

General Discussion.

ENTERTAINMENT

Monday, May 7

Reception and Dance, 7:30 to 12, Gibson Hotel.

Cincinnati Coal Exchange and American Mining Congress, Hosts.

Tuesday, May 8

Sight-seeing trip about Cincinnati, with visit to Rookwood Pottery, for visiting ladies.

Wednesday, May 9

Theater Party for the Ladies.

Thursday, May 10

Informal Dinner and Dance, Gibson Hotel. Special feature entertainment.

Bridge and Tea at Maketawa Country Club for visiting ladies, by Cincinnati Coal Exchange.

Special Golf Privileges at All Cincinnati Clubs.

Cincinnati Reds Play on Home Field During the Week.

Special Entertainment by Music Hall Association.

Luncheons

Members, Manufacturers Division.

Members, Mining and Loading Section, National Standardization Division, The American Mining Congress.

Members, Mine Drainage Section, National Standardization Division, the American Mining Congress.

Members, Mine Timbering Section, National Standardization Division, American Mining Congress.

Program Committee.

Who's Who Among the Manufacturers At Cincinnati

— A —

AHLBERG BEARING CO.—283.

"C.J.B." and Ahlberg bearing lines.

F. O. Burkholder, sales manager, in charge; C. J. Bender, president; B. B. Clark, T. S. Page, A. S. Benge and L. F. Moquin.

ALDRICH PUMP CO.—290.

4½ in. x 5-in. Aldrich horizontal simplex double-acting plunger power pump, standard construction, fitted with silent chain drive and complete with motor; 4½-in. simplex porcelain plunger; 4-in. standard porcelain plunger.

ALLEN & GARCIA CO.—241.

W. C. Adams.

AMERICAN CAST IRON PIPE CO.—290.

Simplex cast iron pipe.

J. E. Holveck, T. L. Simpson and Wm. J. Lyman.

AMERICAN MINING CONGRESS—Lobby.

Headquarters and registration.

AMERICAN RHÉOLAVEUR CORPORATION—16 and 18.

Scene-in-action display of a complete sealed discharge Rheolaveur plant; operating model of a sealed discharge box; operating model of free discharge plant handling fine coal.

P. S. Gardner, G. V. Woody, John Griffen, C. W. Heatley.

AMERICAN WOOD IMPREGNATION CORPORATION—228.

Timber preservatives.

John G. Kreer, vice-president; Scott Calhoun, vice-president.

AMES SHOVEL & TOOL CO.—218.

Hand shovels, scoops, picks. N. E. Brooks, Henry M. Meyers, Walter H. Jenks.

ATLAS POWDER CO.—48.

No exhibit. Rest room and meeting place for visitors to exposition.

AMERICAN CAR & FOUNDRY CO.—17-19-60-62.

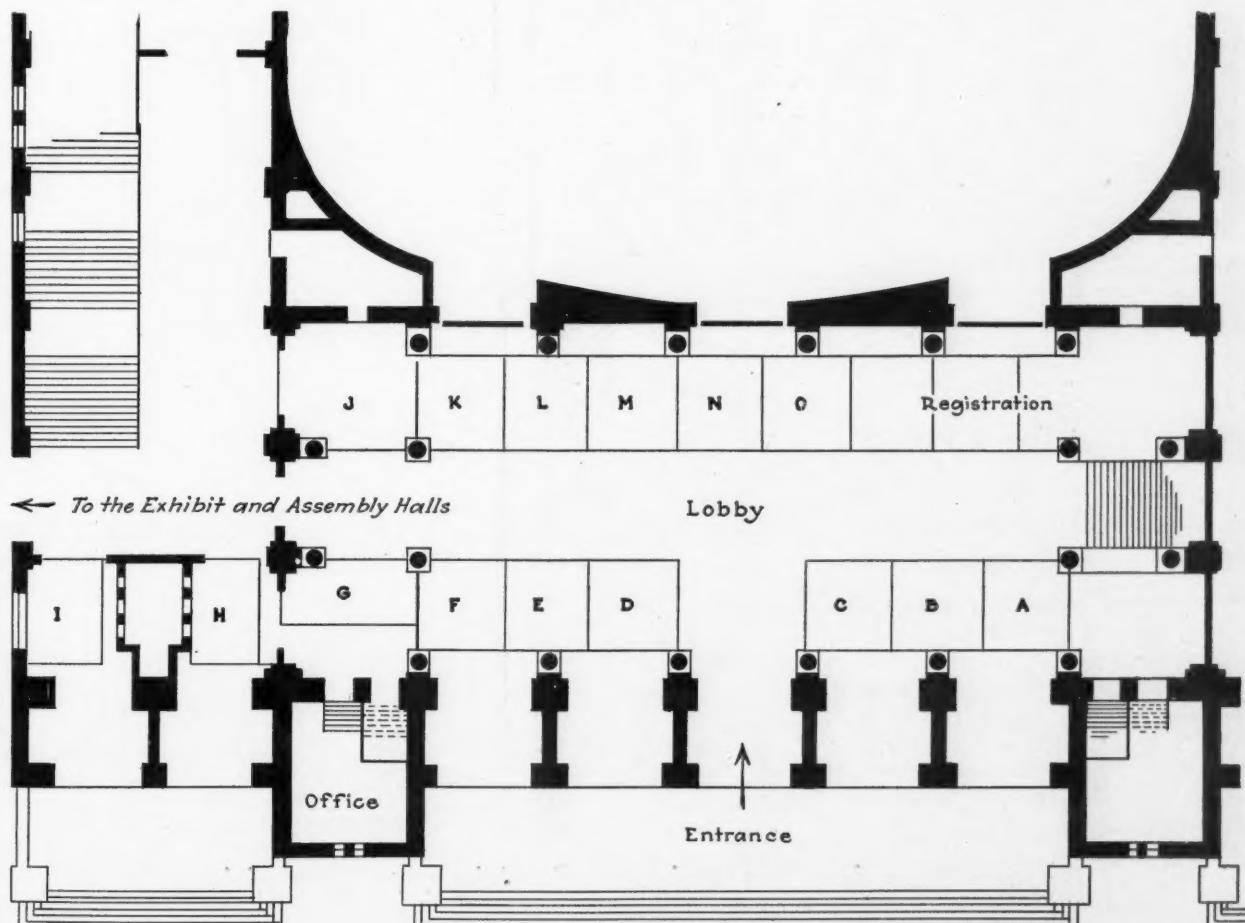
A mine car; mine car wheels equipped with plain bearings; mine car wheels equipped with roller bearings; mine car wheels tested in service.

J. W. Taylor, F. H. Gibbs, J. L. McDowell, R. J. Smith, W. L. Scott, W. F. Lowry, J. W. M. Emsign, L. M. Roe, H. M. Emsign, E. D. Buick, G. C. Elliott, D. B. McCarthy, M. P. McBride, H. P. Field, W. V. Johnson, A. E. Smith and R. A. Lockard.

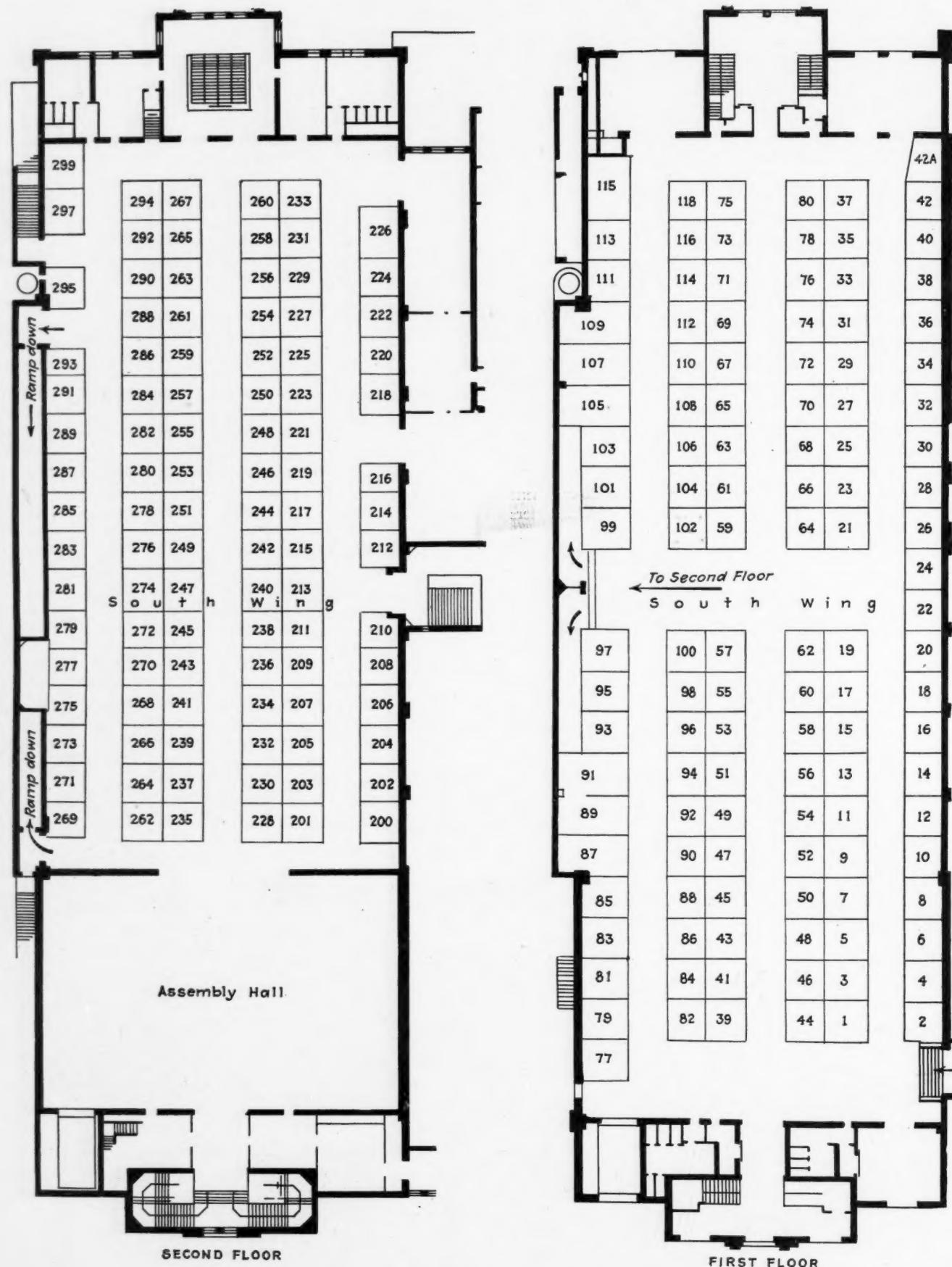
— B —

BALDWIN LOCOMOTIVE WORKS—107.

Jointly with Westinghouse Electric & Manufacturing Co.



Lobby Entrance to Exhibition Hall and Registration Booth



Floor Plan for Convenience of Visitors to Exposition

Exhibitors, Booth Numbers and Representatives Listed

BETHLEHEM STEEL Co.—Two Exhibits. First floor, 68-70-72-74-76; second floor, 273-75-77-79.

First floor—Full-size Bethlehem coal loader, model of Bethlehem coal conveyor. Second floor—Gage rods, mine ties, coupling links, frogs, switches, Bethco rail anchors, mine car sprags, low-type mine car.

N. E. Salsich, J. F. Joy, W. B. Pritchard, J. R. Ulrich, J. E. Rossm, O. W. Johnson, W. H. Stattler, B. F. Faunce and sales representatives from Chicago, Cleveland, Pittsburgh and Cincinnati offices.

BONNEY-FLOYD Co.—117.

Mine-car trucks.
W. B. Floyd, president.

BRODERICK & BASCOM ROPE Co.—65-A.

Wire rope and aerial tramways.

E. M. Stephanus, sales manager; F. W. Grice, manager tramway department; W. J. Ennis, sales engineer and F. W. Vonwehrden, tramway engineer.

BROWN-FAYRO Co.—81-83.

Portable electric room hoist, model HG; Brownie hoist, model HI; chain-flight conveyor mine-car loader; Brownie car retarder, model RA.

H. V. Brown, F. M. Davis.

— C —

CARNEGIE STEEL Co.—289-291-293.

Steel mine timbers, Carnegie copper steel mine ties, light rails and accessories.

Geo. H. Vant, R. L. Twitchell, W. H. Brainard, T. L. Watson, A. C. Jack, J. J. Moakley, C. O. Nash, M. H. Geisking, Harry McBride, R. H. Graham, Francis C. Hardie, John H. Stapleton, Thos. P. Tressler, G. R. Schreiner.

CENTRAL FROG & SWITCH Co.—51-53.

Mine trackwork, frogs, switches, switchstands, etc.
E. R. Heitzman, secretary.

H. M. CHANCE & Co.—6-8.

Coal-cleaning equipment.
H. M. and T. M. Chance.

CHICAGO PNEUMATIC TOOL Co.—266-268.

Electric coal drills specially designed to handle drilling for Cardox; open-type and permissible flame-proof coal drills, electric drills (mounted and unmounted), rock drills, auger drills, riveting hammers and portable repair tools.

L. J. Walker, F. E. Taylor, R. F. Eissler, R. S. Marshall, T. G. Smallwood, R. N. Dold and J. W. Zinkgraf.

COAL MINE MANAGEMENT—212.

J. H. Burton, general manager; A. C. Callen, F. J. Foley and C. W. Edwards.

CONCORDIA ELECTRIC Co.—285.

Electric safety cap lamp with 4-volt dry electrolyte battery, complete with miner's cap and belt attached, generally used for gaseous mines; electric safety trip lamp, approved by the Bureau of Mines, fitted with red glass dome and detachable bracket for attaching to endgate of mine car; portable flood light, operated with 6-volt storage battery and high candlepower bulb producing 50-60 c.p., used for providing distributed light underground in operating conveyors, cutters, loaders, drills, etc.

CONVEYOR SALES Co., Inc.—295.

Two new electric shaker conveyor drives.

R. A. Walter, C. P. Leibold, W. H. Trask, W. W. Baker, A. B. Walter.

CURTIN-HOWE CORPORATION—249.

Timber treatment; sections of mine props treated with zinc meta-arsenite.

C. M. Taylor, E. H. Walker, W. G. Ritt, K. M. Bailey, W. Fritze.

— D —

DAVID EMERGENCY EQUIPMENT Co.—248.

Emergency equipment; first aid kits; gas masks, resuscitating apparatus; hard-boiled hats.

Murray D. Smith and B. F. MacDonald.

DEISTER CONCENTRATOR Co.—65.

Operating model coal-washing table, demonstrating Leahy vibrating screen and the Deister-Overstrom diagonal deck coal-washing table.

DEMING Co.—115.

Mine-gathering pump, 5x5, 50GPM, equipped to operate special Vitrox water end for pump.

E. E. Kendall.

DE LAVAL STEAM TURBINE Co.—77-79.

Double reduction De Laval worm gear, ratio of reduction 975; section cut to demonstrate oiling system.

G. R. DELAMATER—5.

Size 12 and size 20 Delatesters.
G. R. Delamater.

DRAVO-DOYLE Co.—77-79.

Austin standard mine pumps; Austin worm-drive mine pumps; Dravo check valves; Dravo foot valves and strainers; De Laval centrifugal pumps; De Laval worm reduction units.

Edward F. Austin and Clyde Fleming.

E. I. DU PONT DE NEMOURS & Co., Inc.—245-247.

Ventube flexible tuning; powder bags for transportation of high explosives to working face.

C. F. Raney, sales manager; F. W. Hotchkiss, advertising manager.

— E —

EAGLE IRON WORKS—208.

OC 4-type Olson self-dumping cage, a working model.

C. B. Laird, sales manager.

EDISON STORAGE BATTERY Co.—Lobby, E and D.

Geo. E. Stringfellow, vice-president.

ELECTRIC RAILWAY EQUIPMENT Co.—84.

Overhead trolley material.
C. A. Cawood.

ELECTRIC RAILWAY IMPROVEMENT Co.—11-A.

Welding outfits; accessories; welding rods, rail bonds and terminals.

E. B. Moore, N. G. Carlson, L. J. Rinker and P. T. Bevers.

ELECTRIC STORAGE BATTERY Co.—282-284.

Electric storage batteries.
Wm. Van C. Brandt, sales manager.

Mechanical Loading Holds Promise

Substantial progress is being made in mechanical loading in bituminous coal mines. . . . There are at least 28 mines completely mechanical . . . in seven states and loading equipment of eight different manufacturers is being used. . . .

Considerable advance is being made in speeding up primary development by entry-digging machines of several types to take advantage of concentration of workings when mechanical devices are used. . . . Mechanical loading is being considered not only by companies having thick coal but also by those having thin beds, poor roof and seams split by impurities. Cleaning plants are being installed to remove impurities from fine coal.

In general labor leaders realize that industrial progress means less manual labor and that mechanical loading will make it possible for coal mines to employ high-grade men.

Mechanization means larger tonnage from many mines and larger investment, with some increase in fixed charges, . . . keen competition between mines of the new class and the hand-loading mine. However, the increasing use of loading machines . . . in such highly competitive districts as Illinois and Indiana indicates that mechanical loading holds considerable promise for the future.

L. E. Young, vice-president, Pittsburgh Coal Co.—Coal Age, page 309.

ENTERPRISE WHEEL & CAR CORPORATION—
2 and 4.

Mine cars and bearings.
C. P. Daniel, vice-president.

— F —

FAIRBANKS, MORSE & Co.—235 and 262.

Ball-bearing centrifugal pump in operation; a quarter-sectioned ball-bearing centrifugal pump; a mine-gathering pump; a sectionalized ball-bearing motor; a self-cleaning, self-ventilated ball-bearing motor and a direct-current ball-bearing motor.

R. L. Johnson, T. E. Barrett, L. C. Maltby, Glen H. Corlette and G. J. Podlesak.

FLOOD CITY BRASS & ELECTRIC Co.—264.

Controllers for room hoists; rail bonding welding machine; field coil testing machine; axle liners; journal brasses and line material.

Howard Hughes, C. R. Trent, S. Arch Replogle.

FORT PITT MINE EQUIPMENT Co.—243.

Full size model of a four-room feeder equipped with vertical horns.

FREDERICK IRON & STEEL Co.—37 and 80.

Full-size model of a flexible two-track coal separator.

J. T. Norman and A. L. Brice.

— G —

GENERAL ELECTRIC Co.—85-87-89-91-93-96-97.

Eight-ton trolley-cable reel gathering locomotive with sealed electric equipment; 5-hp. d.c. room hoist; 3-hp. 230-volt open type d.c. motor with complete starting equipment; totally enclosed a.c. and d.c. fan-cooled motors; 5-hp. a.c. motor equipped with magnetic starting switch and push-button control; two open type mill motors.

C. T. McLoughlin, in charge; headquarters and district salesmen and engineers.

Mechanical Mining Makes Good

- (1) There are a number of machines which will successfully load coal as fast as it can be taken from them.
- (2) Objections relative to undue breakage have been overcome in a reasonable degree.
- (3) The cost of upkeep and depreciation in cents per ton is reasonable.
- (4) The cleaning feature can be handled; some of the cleaning always has been on top in the light of day, and if necessary to do a portion of it at that point why not equip to do the entire job there better and more economically than it can be done elsewhere?
- (5) Substantial reductions in cost have been demonstrated and further reductions as a result of improvements are now in sight.

Statement by James B. Pauley, chairman of board, Miami Coal Co., at banquet of Ohio Section, A.I.M.E., held at Columbus, Ohio, April 21.—Coal Age, page 291.

MINING men everywhere seem convinced that the idea of mechanical mining can be told to employees only by a slow educational process. My experience, has shown that employees will be as responsive as the equipment they are operating to the opportunities that are afforded them; consequently, if the equipment is positive, powerful and rapid, and the duties of employees and the method of mining well defined, the whole operation becomes simple and surprisingly agreeable to management and employees alike.

Thomas F. Whalen,
General Superintendent
Pittsburgh & Erie Coal Co.
Coal Age, page 267.

GOODMAN MANUFACTURING Co.—56-58.

Locomotives; cutting machines; mechanical loaders.

J. B. James and R. Eagan, in charge; Wm. E. Goodman, sales manager; W. A. Miller, R. C. Beerbower, S. T. Jenkins, B. A. Schroder, A. C. Green, L. H. Harrison, J. S. Housman, Chris Hyland, T. E. Pray and S. W. Farnham.

GRASSELLI POWDER Co.—276.

Wood preservatives and explosives.
W. S. Dennis, H. E. Davis and L. R. Gans.

— H —

HAZARD WIRE ROPE Co.—203.

Wire rope—Hazard green strand, armored wire, flattened strand, Olympic derrick, Bear Cat and non-rotating tubing lines.

Thomas A. Keefe, district manager Pittsburgh.

HENDRICK MANUFACTURING Co.—239.

Perforated screens, steel treads and steel flooring.
Don Bassett, sales manager.

HERCULES POWDER Co., Inc.—Lobby “L”
Hercal-F permissible.

J. T. Skelly, vice-president; C. C. Gerow, sales manager; N. S. Greensfelder, advertising manager; J. H. Horlick, manager of service division; T. Marvin, business manager of *The Explosives Engineer*; J. J. O'Neill and several branch managers.

F. H. HOLSTEIN—244.

HOCKENSMITH WHEEL & MINE CAR Co.—61.

Mine cars; trucks; hitchings.
H. H. Herbster, vice-president.

HULBURT OIL & GREASE Co.—Lobby, C.

Lubricants and lubricating devices.
John R. Michael, general manager; Webb Wanner, sales manager; F. K. Clark, vice-president.

HYATT ROLLER BEARING Co.—286-288.

Hyatt Roller Bearing journal box; roller bearings for mine cars; automatic leaf turning display book of products.

Howard K. Porter, B. H. Lytle, R. H. Leonard, C. L. Newby, T. A. Russell and J. V. Leahy.

— I —

IDEAL COMMUTATOR DRESSER Co.—292.

Commutator resurfacers; blowers; power mica undercutters; tool rests; fuse pullers; splice pliers; armature wedge and coil tamping tools.

R. F. Waldo, in charge.

IRONTON ENGINE Co.—76-78.

Locomotives and underground conveyors.

E. H. Allfree, general manager.

— J —

JEFFREY MFG. Co.—86-88-90.

8-ton totally inclosed cable-reel locomotive.

A. D. Mahoney, in charge, assisted by members of mining engineering staff.

JOY MANUFACTURING Co.—31-33-35.

Improved type 5 BU permissible Joy loader.

Walter M. Dake.

— K —

KEystone LUBRICATING Co.—39-82.

Keystone pneumatic safety lubricator demonstrating method of lubricating mine-car wheels. Complete line of mining lubricants. H. A. Buzby, president; G. W. Hall, J. H. Yerkes, Peter Cassidy, W. P. Kline, O. V. Schauer, H. D. Greene, W. H. Vickers, R. C. Barlow, M. Dickelman.

— L —

LA BOUR Co.—38-40.

Type S pump fitted with glass suction lines; automatic gathering valve and Elcomet alloy castings.

N. A. Pedersen.

A. LESCHEN & SONS ROPE Co.—47.

Wire rope and fittings.

Walter C. Richards and J. G. Hardy.

LINK-BELT Co.—41-43-45.

Link-Belt kangaroo conveyor drive unit; baby kangaroo conveyor; anti-friction idler; framed photographs illustrating the new Link-Belt Simon-Carves coal washeries; also framed photographs of many other articles manufactured by Link-Belt Co. for the coal-mining industry.

George Jaxon, Rex Martin, R. A. Mitchell, Alexander Palmros, A. J. Sayers and T. Frank Webster.

LORAIN STEEL Co.—23-25-27-29-29A.

Underground conveyors, mine cars, jacks.

C. Burton, president; Otto Sann, mechanical engineer; Wm. Moyer, Maxwell Rahner, Elmer Reese and G. J. Hahn.

— M —

MARTINDALE ELECTRIC Co.—221.

Commutator stones; grinding tool; portable blowers; electric insulation testing instruments and commutator under-cutting machines.

H. McFarland, James H. Parks and R. O. Hallier.

McGRAW-HILL PUBLICATIONS (*Coal Age* and *Keystone Catalogs*)—269 and 271.

J. M. Carmody, R. D. Hall, Sydney A. Hale, J. H. Edwards, H. W. Clarke, H. C. Rowell, W. M. Spears, E. H. Leslie, Roger Rothwell, Ralph C. Becker, W. H. Lees and W. Boyd Kegg.

MINING ENGINEERING Co., LTD.—34-36-38-40.

26-in. sectional belt conveyor; model E 22 shaker conveyor driving gear, open to show internal construction; section of Ball-cum-roller troughing; electric heading machine for narrow work.

Clarence R. Claghorn and Harold C. Jenkins.

MINE SAFETY APPLIANCES Co.—Lobby, J and K.

Edison electric safety cap lamps, models F and G; M.S.A. type 65 rock-dust distributor; McCaa two-hour oxygen breathing apparatus; Burrell all-service gas mask; H-H inhalator; self-rescuers; stretcher outfits; carbon-monoxide detectors.

J. T. Ryan, in charge.

MINING SAFETY DEVICE Co.—287.

Automatic cagers; automatic bumper stop feeder operating with rotary dump; automatic scale feeder.

Glen W. Merritt.

MODERN MINING PUBLISHING Co.—219.

P. F. Jasik, manager and editor.

MORROW MANUFACTURING Co.—272-274.

Tipple and coal preparation equipment. Frank C. Morrow, president; H. S. McClain and L. R. Crowell.

MYERS-WHALEY Co.—22-24-26-28.

New Whaley single-motion shovel. Wm. Whaley and Chas. Whaley.

— N —

NATIONAL CARBON Co., INC., JOINTLY WITH UNION CARBIDE Co.—Lobby, M and N.

Carbon brushes for electric motors, generators and converters; welding carbon products; batteries; flashlights; shot-firing units.

J. A. Hammond, V. J. Nolan, E. G. Gerber and G. B. Tatum.

NATIONAL MALLEABLE & STEEL CASTINGS Co.—201.

Willison mine-car couplers; steel mine-car wheels; plain and swivel hitchings; cast steel steam shovel chain.

George R. Farrell, R. M. Titgemeyer, R. J. Wittmer and David Robinson.

J. A. Plimpton, in charge; F. H. Neely and H. M. Hallett.

PHILLIPS MINE AND MILL SUPPLY Co.—54-A.

Working models of automatic cross-over dump; gravity rotary dump; Phillips open-car wheel trucks; Timken roller-bearing trucks; mine car accessories; tipple chutes; sections of pans for face conveyors.

J. Milton Duff and Mark C. Simpson.

PITTSBURGH COAL WASHER Co.—49A and 92A.

F. F. Bollinger, president; Mr. Llewellyn, sales manager.

PITTSBURGH KNIFE & FORGE Co.—108-A. Mine-car couplings, drop forge swivels;

ULTIMATELY from 70 to 90 per cent of the coal mined in the United States is going to be powdered, gasified or processed. No man can forecast just how this will be brought about nor exactly what proportion of the coal production of 1940 will be used in any particular branch of industry. Certain trends already evident are, however, quite definite. These show that probably 40 per cent of the coal mined in that year will be processed for manufacture of coke, gas or bituminous oil.

R. S. McBride, chemical engineer,
—*Coal Age*, March, page 151.

NIAGARA CONCRETE MIXER Co.—120.

Concrete mixing equipment.

A. E. Owen, W. N. Miller, J. S. Morrison and A. J. Schaefer.

R. D. NUTTALL Co.—113.

DVR double reduction speed reducer; SVR single reduction speed reducer; Nuttall electric steel pole head and harp complete; flexible coupling, type C; trolley pole and mining gears.

NEW DEPARTURE MANUFACTURING Co.—208-209.

New Departure ball bearings for conveyors, mine cars, pumps, locomotives and electric motors.

Dudley W. Nearing, in charge; John Baninger, Lisle H. Gaylord, B. C. Street and John Collins.

— O —

OHIO BRASS Co.—55-57-98-100.

Improved fused trolley tap; insulated I-beam hangers; trolley frogs; I-beam clamps; trolley shoes; trolley splicers; dual bulldog trolley clamp and mine catenary clamp; line materials.

J. C. Wilson, manager mining sales division, in charge.

OSBORNE REGISTER Co.—238.

Scrip issuing and recording registers; card files and visible duplex scrip card index.

W. G. Jenkins and E. H. Ingle.

— P —

PENNSYLVANIA CRUSHER Co.—216.

Model of the "Pennsylvania" Bradford coal breaker and cleaner.

mining machine bits; drop forged links. Earl J. Rigidon.

PORTABLE LAMP & EQUIPMENT Co.—281.

Electric safety lamps; stills; rock dusting equipment; coal drills; bit sharpeners; hoists.

George C. Nelms, sales manager.

POST GLOVER ELECTRIC Co.—270.

P-G Homanite resistance grids. Clarence E. Nuckles, in charge; Joseph Thiem and Robert Houp.

PURE OIL Co.—251-278.

Lubricants.

H. A. Douglass, C. J. Simpson, G. R. Fenner, J. T. Wheeler, W. W. Hensley and G. W. Hall, Jr.

— R —

ROBERTS & SCHAEFER Co.—7-9-11-50-52-54.

Menzies hydro-separator; Arms vibrating screen; Arms air-concentrating tables in operation.

Ray V. Arms, vice-president, in charge.

ROBINSON VENTILATING Co.—299.

Working model of a Robinson 5x3-ft. reversible $\frac{1}{2}$ housed mine fan with steel side drift, steel air lock and explosion doors.

JOHN A. ROEBLING'S SONS Co.—92.

Wire rope and fittings.

F. J. Maple, R. R. Newell, W. K. Hanna, W. W. Affleck and L. W. Reid.

ROME WIRE Co.—213-215.

Rubber covered and insulated cables; copper wire; etc.

C. A. Scott, sales manager.

— S —

SANFORD-DAY IRON WORKS, INC.—63-104-106-108.

Miniature mine in operation equipped with S & D Griffith automatic drop bottom mine cars; eight-wheel whopper automatic bottom dumping car.

J. F. Baker, Geo. E. Jones, Jr., H. W. Jones, J. W. Jones, S. M. Casterline, E. W. Light, D. B. Benscoter, W. O. McKamey and H. S. Geismer.

SIMPLEX WIRE & CABLE CO.—230.

Tirex locomotive; motor lead; mining machine cables, 2 and 3 conductor; Tirex portable cords and shot fire cable; Selenium 60 per cent patented rubber compound.

A. Hagen, in charge; G. L. Roberts.

S. K. F. INDUSTRIES, INC.—44-46.

S.K.F. conveyor and other mining units equipped with S.K.F. ball and roller bearings.

G. H. Spencer, T. H. Dessez, M. B. Gebauer and J. W. Grafton.

STREETER-AMET WEIGHING & RECORDING CO.—20.

Automatic weighing and recording scale equipment.

H. F. Reck, president.

SULLIVAN MACHINERY CO.—67-69-71-73-75-110-12-14-16-18.

Sullivan CLU combined mining and shearing machine; Sullivan coal loading machine; longwall Sullivan ironclad, 12-in. high; Sullivan double drum electric 25 hp. hoist for scraper loader service.

Raymond B. Hosken, Charles B. Officer, M. C. Mitchell, Wm. R. Jarvis, E. L. Thomas, J. S. Walker, Jr., G. P. Small and other territorial engineers and salesmen.

ORVILLE SIMPSON CO.—94-96.

Rotex heavy duty screen in operation; dull size cut-away drive mechanism operating at slow speed to show construction and method of balancing screen box.

Allan Crain, sales manager.

SAFETY MINING CO.—236.

Cardox safety mining cartridge.

Edwin H. Johnson, in charge; Frank H. Kneeland and B. L. Lubelsky.

— T —

TRAYLOR VIBRATOR CO.—42-42A.

Vibrating screening and conveying equipment.

Paul Wigton.

Revolutionizing an Old Mine

Most of the completely mechanized mines changed from hand loading gradually. Operators necessarily felt their way cautiously, making initial installations of one or perhaps two or three machines of a type. But persistent experimenting and the accumulation and interchange of data seem to have brought the art of mechanization to a point where it is safe to plan and execute a complete change at one stroke.

*Paul Weir,
General Superintendent
Bell & Zoller Coal & Mining
Co., and
J. H. Edwards,
Coal Age, page 288.*

TEMPLETON, KENLY & CO., LTD.—232.

Line of Simplex jacks for mine and track; Simplex timber jack and No. 85 mine machine jack featured.

W. L. Simpson.

TIMKEN ROLLER BEARING CO.—59 and 102.

Bearings of the type used for railway service; models of mine-car wheel bearing appliances; bearings for mechanical mine equipment including loaders and tipplers.

L. M. Klinedinst, sales manager; R. P. Kelley, advertising manager; E. R. Phillips, J. L. Young, E. C. Reitherl, O. G. Smith, R. P. Proffitt and J. A. Robinson.

TOOL STEEL GEAR & PINION CO.—237.

Gears and pinions and repair parts for locomotives and mining machines. The company extends an invitation to guests of the Congress to visit their factory in Cincinnati.

P. H. Conroy.

W. S. TYLER CO.—1 and 3.

Hum-mer electric screens; Tyler woven wire screens; testing sieves; Ro-tap testing sieve shaker.

G. R. Delamater, in charge; C. F. Spangenberg and Ben H. Cartwright.

— U —

UNION CARBIDE CO., JOINTLY WITH NATIONAL CARBON CO., INC.—Lobby, M and N.

Carbon brushes for electric motors, generators and converters; welding carbon products; batteries, flashlights, shot-firing units.

H. C. Stelling and H. W. Smith.

UNITED STATES BUREAU OF MINES—Lobby, F and G.

— W —

WATT CAR AND WHEEL CO.—13 and 15.

5 one-quarter size models, each showing a different type mine car.

J. E. Graham, W. C. Wilson, B. E. Schonthal, Benedict Shubart, R. L. Edgar, H. H. Watt and P. H. Laughlin.

WAVERLY OIL WORKS CO.—256.

Lubricants.

R. M. Lengenfelter and J. E. McEvilla.

WEINMAN PUMP MANUFACTURING CO.—14.

Mine drainage pumps.

W. N. Weinman, president; I. V. Pressler, sales manager.

WEIR KILBY CORPORATION—21-64-65.

The Weir Titan frog mine turnout; switch stand with enclosed spring connecting rod; light guard rail and guard rail clamp.

R. F. Gordon, in charge; J. K. Lansdowne, vice-president.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.—99-113 inc.

38-ton three-motor Baldwin-Westinghouse locomotive developing 399 hp.; three display boards of overhead electrical equipment, a motor for room hoist service, a sectionalized SK motor and some developments in renewal parts equipment.

WEST VIRGINIA ARMATURE CO.—211.

Armature equipment.

WEST VIRGINIA RAIL CO.—10 and 12.

Track material including a self-locking parallel throw switch stand; a one-piece point super service frog; portable turnout designed for mechanical mines.

C. C. Watters, J. B. Haskell, J. W. Blanchard, W. L. Gebhardt and B. E. Schonthal.

Hazleton Welcomes ENGINEERS OF ANTHRACITE REGION

NONE of the joint meetings of the Lehigh Valley Section of the American Institute of Electrical Engineers has been so well attended or of so great interest as that which on April 21 was held at Hazleton, Pa., in the Hotel Altamont. This meeting was a joint session, to quote the program, of the "combined troupes" of the Lehigh Valley Section, the Engineers' Club of the Lehigh Valley and the Engineers' Society of Northeastern Pennsylvania, and all three contributed to make the meeting overflowing and successful.

Hazleton rejoices in having the research laboratories which are jointly financed and supported by the Electric Bond & Share Co. and the Pennsylvania Power & Light Co. In these, analyses are made of all the coals used by the companies mentioned and their affiliations, these tests covering not only the proximate but, at times, the ultimate analysis also, as well as the calorific power of the fuel and the temperature at which the ash in the coal fluxes. The laboratories in which this is done were visited by the members.

The fluxing temperatures are ascertained by matching the color of a heated wire with the temperature of the furnace, the glowing wire being so placed that the heat of the oven forms a comparable background. The oven is heated by gas and the wire by a current which is varied so as to give the filament the right hue.

ATABULATION, which the chemist who makes the pyrometer test keeps at hand, shows the relation between current intensity and the heat of the wire and therefore the heat of the oven, the two intensities being, as already stated, matched by the color sense. The demonstrator said that the temperature could be read within 20 deg., which is close enough for the type of investigation and quite satisfactory as pyrometer readings go. Tests are made also of refractories and surges are being studied. These surges have done much damage and have an obscure origin which the company is trying to trace.

What pleased the visitors perhaps more than anything else was the care taken for safety. The rubber gloves and shoes that the electrical men use for protection against high-tension current are tested every two weeks. They are filled with and set down in water, and a terminal is put into the water in the glove and another terminal in the water outside. If the gloves stand the test they are good for two weeks and for two weeks only. Of course, they

are tested before they are put into use. One batch of gloves were almost 50 per cent rejects, but as a rule the manufacturer, who knows that these rigid tests will be made, is careful not to thus jeopardize his business.

The rubber blankets also are laid in a metal tray and filled with water. A terminal is laid in the liquid and connection made with the tray by another terminal. The edge of the blanket which is never used is not tested.

The sleeves, which are hung over wires for the protection of wiremen are put in a conducting case for test. Material rejected is not marked and laid by, for someone might use it by mistake or to satisfy some pressing need. It is dumped into a tightly locked cell below the floor of the building whence it is taken and sold for scrap when enough has accumulated. Transformer oils also are tested at intervals.

Moving picture demonstrations were given at the plant of the P. P. & L. Co., showing various phases of modern electrical development. The Televox that transmits signals, making it possible to direct the operation of automatic sub-

stations at a distance without the services of an attendant, was exhibited.

The automatic substation keeps things going according to a predetermined schedule, but it has no brain. The Televox makes it possible to revise that schedule without visiting the station when such revision is desired. Perhaps the Televox will be the next development at mines. The lines of the telephone company are almost essential for this work, but whether they may be used for this purpose is as yet not quite satisfactorily determined. To install and maintain a new system of wire communications for this purpose would seem excessively costly. After all, private lines do not have a reputation for wholly reliable service.

In the absence of John Mills, director of publications, Bell Telephone Laboratories, New York City, Paul B. Findley, editor of records of that company, delivered the address on "New Developments in the Application of Communication by Electric Current to Transatlantic Telephones and Television."

R. J. Wensley, engineer and "Father of Televox," Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., addressed the meeting on "The Application of Communication Facilities to the Control of Electricity."

It was announced that the American Society of Mechanical Engineers intends to form an Anthracite-Lehigh Valley section and hold meetings for mechanical engineers, jointly with the American Institute of Electric Engineers.

Discusses Roof Control at Philadelphia Meeting

(Continued from page 293)

plan are: the reduction in the length of face with its accompanying loss of efficiency in cutting, loading and gathering; the need of five conveyor drives, where there are five faces instead of one, affecting both first cost and the costs of moving forward and anchoring drives and the decreased supervisory and ventilation efficiency due to the increase in the number of places served.

The depth of cut could not be safely made $6\frac{1}{2}$ ft. because of the pressure being concentrated near the salient angles of the stepped face. This decrease in depth of cut would reduce the efficiency still further. The total development required by the stepped face would be more than twice that required with our assumed perfect longface. All the development would have to be completed before any longface could start, thereby "freezing" working capital.

Lastly, the five points where conveyors load the face coal into cars are not on the main longwall heading but are on the five additional headings driven for this purpose. Consequently, switches, frogs and trackage must be maintained in each of these headings; this equipment must be recovered as the faces retreat; cogs must be maintained

on one side of each heading to hold open a haulageway from the loading point to the end of the "step" of the adjacent face; five workmen instead of one are required to have charge of the loading of the cars and the gathering haulage equipment is handicapped in having to place short trips on stub tracks instead of being able to maintain a steady stream of cars by means of long trips on a straight track.

IN A room 24 ft. wide, 300 ft. long and 600 ft. below the surface the weight of the overburden is 720,000,000 lb. If the roof were fairly good and the coal were 6 ft. thick, the timbering probably would consist of three rows of 6-in. props on 5-ft. centers, or 180 props, each of which would carry a safe load of about 14,000 lb., so that their combined load-carrying ability would be 2,520,000 lb., or about a third of 1 per cent of the total load over the excavation. Thus the installed timber would carry safely only 2 ft. of roof. The function of timber therefore is only to hold in place any slab tending to become loose and to give warning of approaching roof settlement.

The strength of a good roof must be

an inherent function of the successive strata immediately overlying the coal and acting as beams spanning any opening from rib to rib. If this is true, then the same dimensions of rooms under similar immediate roof conditions could be used without any consideration being given to the depth of cover. Apparently the only reason why the percentage of recovery by first mining with the room-and-pillar system must be less with heavy than with light cover is because the pillars with the heavy cover cannot support the load and not because the openings cannot be satisfactorily spanned by the immediate roof strata. The bottom clays also under pressure are extruded from under the pillars.

In any large fall in flat workings a vertical section at right angles to the horizontal break line, said Mr. Williams, will show an upward break on a line roughly at 45 deg. to the strata and pointing away from the pillar. In all the longwall faces which have failed by the roof riding over the supports I have yet to see or hear of a case where most of the equipment and machinery thus buried could not be recovered for reuse, though recovery was at times difficult and costly. After such failures there usually is ample room for a man to crawl along the face, hugging tight to the coal rib.

Making the assumptions that the immediate roof that must be held by the artificial supports is 100 ft. thick and that a total width of 17 ft. (including the $6\frac{1}{2}$ ft. of undercut) must be supported, then imposing half this on the face of the coal, the burden must be 54,400,000 lb. on a 400-ft. face which could be safely held by 3,900 6-in. or 1,063 12-in. props, and all these would have to be accommodated in an area 400 ft. long by $3\frac{1}{2}$ ft. wide (for no more could be spared), a total of 1,400 sq.ft. A jack designed to carry safely 200 tons would carry as much as 29 6-in. props or 8 12-in. props. With this in view a rigid jack was designed by Weston Dodson & Co. which was manufactured by the Lorain Steel Co.

Nine longwall faces in four different mines have been driven a total distance of over a mile. Of these nine faces, four completed the extraction of all the coal in a predetermined area, one is temporarily idle and four are still advancing daily. The longest advance of any one face is 2,400 ft. It has 1,000 ft. yet to go before it reaches the property line.

THE illustrations on p. 293 show the arrangement. Where the roof is strong the jacks in the double outer or break row are set 4 ft. apart from center to center. The jacks in the safety row are spaced on 8-ft. centers. Where the roof is only fair the safety row as well as the back row is set 4 ft. apart from center to center. Where the immediate roof is bad the single outer row of jacks (called the break row) and the drawslate row are set at 3-ft. centers. This drawslate row supports the outer end of H-beams 15-ft. long which are placed in round

TABLE I—TONNAGE PER EMPLOYEE, HAND LOADING

Thickness of Bed, Ft.	Tons per Day on 400 ft. Face	Number of Shovelers	Other Laborers	Total Employees	Tons per Total Employee.
3	300	14	12	26	11.5
4	400	19	12	31	12.9
5	500	23	12	35	14.3
6	600	27	12	39	15.4

TABLE II—TONNAGE PER EMPLOYEE, MACHINE LOADING

Thickness of Bed, Ft.	Tons Per Day on 400-Ft. Face	Total Employees	Tons Per Employee
3	300	18	16.7
4	400	18	22.2
5	500	18	27.8
6	600	18	33.3

holes drilled just below the roof 7 ft. deep into the solid coal, the holes being made before the coal is undercut. The third or safety row, consisting of light pipe jacks, keeps the steel beams from sagging.

The depth of cover overlying the nine longwall faces has varied from 90 to 650 ft. The pressure on the jacks at different depths has not been measured, but in large testing machines at the universities the indentations made by the jacks in wood sills and collars under known loads have been compared with those obtained in practice in the mines. The observations lead to the tentative belief that for a given thickness of coal bed the working pressure on the longwall face is approximately the same for shallow as for deeper mining.

In a new longwall face much progress is made before the roof collapses. Just prior to the fall the break row of jacks is called upon to carry its greatest load and immediately following this collapse the pressure on the jacks will be almost nothing. In one instance the pressure drove the jacks 1 to 2 in. into the wood collars or sills. Two hours later the roof had fallen beyond the break row and the pressure was so relieved that a piece of cardboard could in several cases be passed between the collars of the break row and the roof. The distance which each of the nine longwall faces had advanced before the first break occurred varied between 70 and 90 ft.

ONE may rely with confidence on the occurrence of a complete break every day where there is a shale roof of good quality, but with a strong sand rock the break may not occur so readily. However, the jacks will carry the weight till the next advance causes fracture.

After the first break the pressures might be expected to be uniform, but it is found that at intervals of 200 to 300 ft. the pressure will increase. These pressures have never been as great as those just prior to the first break and have never lasted more than two or three days.

The total number of jack placements to date on the nine longwall faces is over 600,000. The theoretical breaking load for the jacks is 550 tons; the

safe carrying load is 200 tons. Two jacks have been damaged by pressure; the failures were due to flaws in the outer edge of the baseplate. Neither break caused the jack to fail in carrying its load. A few jacks have been lost in the gob when the men were unacquainted with their work.

The wage scale varies at the four mines where the jacks are used. Some mines are union, some non-union. Loading by hand pays the base rate; loading by machine 40 per cent more; undercutting both for cutters and scrapers 20 per cent more; men who drill and shoot, whether principals or helpers, 20 per cent more; jack operators 10 per cent more; haulage motormen and brakemen 20 per cent more and foremen 60 per cent more.

It is noticeable that the helpers are paid as much as the cutter, the driller and the shooter because the men find the work more continuous and monotonous than room-and-pillar work. In consequence, the helpers "spell" their principals. Furthermore, this schedule permits the leader to train the helper, and in the absence of the leader the helper is fully qualified to perform the day's task with a green helper. Savings of 50c. at one mine and 74c. at another have been made as against room-and-pillar operation.

The following units of cost in terms of man-days, the latter of 8 hours duration, will give an idea of the possibilities with this system. Under average cutting conditions two men, a cutter and a scraper, will cut daily a 400-ft. face $6\frac{1}{2}$ ft. deep. The yield in marketable tonnage may be conservatively figured at 100 net tons per foot of bed thickness.

TWO men, equipped with an efficient boring machine, will drill, load, tamp and fire the 66 holes on 6-ft. centers along the 400-ft. face in eight hours. Where the roof is good hand shovelers in a day will load an average of 21 to 24 net tons per man and also will advance the safety jacks and the conveyor the required distance. A crew of six men will install the new double break row of jacks, will collapse the old double break row and will build one cog along the loading heading in one shift of eight hours.

The twelve men on the face are performing work which is independent of the thickness of the coal bed. Only the number of shovelers is dependent on the tonnage. Consequently Table I can be constructed showing estimated help and tonnage for various thicknesses of coal.

By using two shovel operators and four helpers to load the coal, move the safety jacks and advance the conveyor, the results given in Table II could be expected. Loading machines have not been used in the Weston Dodson mines because the coal was too low. The table excludes from consideration development work, maintenance of equipment and supervision.

Major L. Rodman Page, representing the National Coal Association,

vice-president, Crozer Coal & Coke Co., of Philadelphia, Pa., presided. Prior to Mr. William's paper, one was presented on "Fundamental Principles in Materials Handling" by Harold Vinton Coes, vice-president and general manager, Belden Manufacturing Co., Chicago. In his absence Robert M. Gates, publicity manager, Industrial Division, Superheater Co., New York City, read the paper.

Mr. Coes prefaced his remarks with the statement that the men displaced by a reduction in the labor of handling materials would find ample opportunity for their efforts in the development of new industries.

According to W. K. Liggett, consulting engineer, Jeffrey Manufacturing Co., Columbus, Ohio, said Mr. Coes, the distribution of cost is as in Table III.

TABLE III.—DISTRIBUTION OF COST IN FOUR MINES

Operation	(1)	(2)	(3)	(4)
Cutting.....	\$0.12	\$0.11	\$0.14	\$0.14
Loading.....	0.41	0.48	0.81	0.80
Miscellaneous.....				
Day Labor.....	0.13	0.16	0.30	0.30
Underground.....				
Miscellaneous.....				
Day Labor.....	0.12	0.15	0.24	0.24
Above ground.....				
Total.....	\$0.78	\$0.90	\$1.49	\$1.48

(1) Bed 78 in. thick, drift mine, Pennsylvania, non-union.
 (2) Bed 48 in. thick, drift mine, West Virginia, non-union.
 (3) Bed 60 in. thick, shaft mine, Indiana, union.
 (4) Bed 72 in. thick, shaft mine, Illinois, union.

"It will be noted," says Mr. Coes in his paper, "that the loading cost in the non-union mines was 52½ and 53½ per cent and for the union mines 54 and 53½ per cent, so that regardless of the wage scale the loading cost was better than 50 per cent in each case. This portion of the processing then would seem to indicate an opportunity to introduce mechanical appliances and intensive materials handling, for if this cost could be lowered from 40 to 50 per cent it would effect a material reduction in the total labor cost and hence in the total cost of production."

IN HIS discussion Mr. Williams said that moving jacks was so easy a job and so much in demand that the wage had been reduced to the base rate instead of 10 per cent additional thereto. It had been found desirable to increase the cutting depth from 6 ft. 6 in. to 7 ft. 6 in., with the result that 25 gross tons is being mined per start in place of 21 to 24 net tons.

He added that preparations are being made to reduce still further the supported area, thus increasing the safety by reducing the weight on the jacks. At first 27 ft. of a shelf was left in order to relieve the fears of the mine workers but while the men were appeased by this provision they were in a degree jeopardized. The less protection they appear to receive, the greater their safety. In mining a 6-ft. seam a shelf of only 42 in. will be left beyond the face.

Cadwallader Evans, general manager, Hudson Coal Co., Scranton, Pa., said that he believed that we should have to learn to walk before running. Our

mechanization will have to be through the room-and-pillar method rather than by the revolutionary plan of adopting both longwall and entire mechanization at a single stage. The old workings in the anthracite region were so hampered by earlier room-and-pillar developments that longwall could be introduced only in certain sections. What made efficient operation difficult in rooms and pillars was undependable and inefficient methods of transportation. There had been for many generations, as Mr. Williams said, little use of brain power to solve the problems of the working face, but supervisory methods, handicapped as they were by ribs and darkness, had done something to improve face operations.

H. F. McCULLOUGH, director of engineering, Consolidation Coal Co., Fairmont, W. Va., said that room-and-pillar was not to be condemned in such unqualified terms as Mr. Williams had used. It had inefficiencies, it is true, but they were not as bad as he painted them. Moreover, the use of longwall was not without drawbacks. Twenty rooms to 100 tons might be the rule for room-and-pillar operation but it was quite feasible to get that much coal from four rooms. Concentration methods of operating room-and-pillar workings gave nearly all the advantages of longwall without its disadvantages.

Development cost, Mr. McCullough said, was an objection to room-and-pillar operation but the difficulty in obtaining the requisite development had been reduced by shearing machines.

Mr. Williams had elaborated a system based on a length of face that can be cut and loaded once every eight hours, said Mr. McCullough, but with rolls and uncertainties how shall the distance that can be cut be determined? Rolls might make it necessary to reduce a 400-ft. face to 200 ft. The capacity of the loading machine, he declared, is equally difficult to determine.

Dirt bands, according to Mr. McCullough, are as effectively handled in rooms as in longwall. Mr. Williams, he added, has demanded that we abandon room-and-pillar operation without first giving us an opportunity to improve our room-and-pillar system. It is better for us to analyze it and find if it cannot be so improved and systematized as to make it more efficient. The easiest way out of a difficulty, say some people, is to leave it. Mr. Williams seems of that opinion, said Mr. McCullough. Room-and-pillar is inefficient, therefore abandon it and take up longwall, being careful, however, to systematize that new method of working.

"We have had one hundred years of experience with room-and-pillar methods, and the inefficient conditions we now have are the result," replied Mr. Williams. "Time we have had; why ask for more? I agree twenty rooms for 100 tons are more rooms than are frequently working. The other day I went into a mine with 52 working rooms and an output of 1,200 tons daily, or 4½ rooms per 100 tons—about

Mr. McCullough's figure—but how many idle rooms did I not have to traverse? Moreover, the mine worked only three days a week and the miners went underground daily, day after day and they had cars to load on idle days and mules with which to place them. That is a proposition entirely different from that of the longwall face."

There was, Mr. Williams admitted, some difficulty in determining the length of the ideal longwall face. In one place there were twelve rolls to be cut, and because of that fact the face was made 300 instead of 400 ft. long. A face 285 ft. long without rolls could be cut in 2 hours 15 minutes to 3 hours 15 minutes. There was no reason why the longwall face should not be double-shifted.

Mr. Evans said that the Hudson mines had some 5,000 working places. Only 168 of these might be termed modified longwall. He would have preferred to make them all longwall faces had that been possible. The longwall coal is a dirtier product than that from room and pillar and must be cleaned on the surface.

Management factors, Mr. McCullough thought, should be tackled first and the technical features of roof control thereafter.

THE cost of installation having been emphasized, Mr. Williams declared that a 400-ft. face could be equipped with jacks and a new cutting machine, if one were needed, for 10 or 12c. per ton of annual production. As the whole cost of equipping a bituminous mine ran \$4 a ton as an average, the few cents for equipping the longwall face should not be prohibitive, especially as he had proved in practice that the equipment would save no less than 50c. a ton. On some faces the saving had been more.

Appreciation of the value of longwall, especially as conducted by Mr. Williams, was expressed by R. Dawson Hall, but he added he could not feel that Mr. Williams had been wholly fair to Mr. McCullough and the room-and-pillar system. Mr. Hall gave several instances of successful operation of narrow places, some of which are described in articles in this issue. In these the tonnages compared quite favorably with those Mr. Williams hoped to obtain in thicker coal. He said that the room-and-pillar method might be one hundred or many more than one hundred years old, but it must be remembered that the mechanical devices which Mr. Williams used and proposed to use on his longwall faces were adapted for use on narrow work, namely, conveyors, kerf cutters, loading machines, explosives, drills and what not. Management also and task work could be applied to room work as well as to longwall. In fact they were being applied and their effects were as remarkable as with longwall.

INDORSING Mr. Williams' suggestions as to roof action, Mr. Hall said that the roof in bending might be compared to a sapling being bent. When the stress becomes greater than the outer

layer of the sapling can resist, that layer breaks. Further stress shows the existence of a shear which rips the outer layer off the main stem and the two ends of the outer layer stand tangentially to that stem at the points to which the shear has extended.

A similar horizontal shear may exist in the roof even before rupture. In fact we know that the draw-slate draws or shears from the main roof before it fractures. It is termed a *draw-slate* just because it draws away from the main roof. When the strain is severe, great thicknesses may be thus drawn away, especially after the fracture of these layers.

Mr. Williams has suggested that 100 ft. of roof may thus be loosened. This forms a beam separate from the main roof beam, which latter is more rigid and breaks less readily, if at all. The immediate roof beam not only loses its integrity with the main roof but actually leaves it, forming an open space thereby.

SUPPOSE it is held from falling near the working face by a line of jacks, and later breaks in the open space just beyond the jack line; the stress on the immediate roof beam is reduced and that roof beam actually lifts. Thus the jacks or posts, if there are any, are released from pressure, for the immediate roof once more springs back toward the main roof from which it was parted by the strain induced by the weight of rock reaching out far beyond the jack. Mr. Williams in his paper has shown that where before a break the jacks were forced 1 or 2 in. into the wood collars and sills, after the break the pressure was so greatly relieved that a piece of cardboard could, in several instances be passed between the break-row collar and the roof.

Mr. Hall also referred to the belief prevalent in Europe as also in this country that the lower layers of roof broke and fell in such a disorderly state as to fill completely the void resulting from coal extraction and thus to support the roof.

This idea is erroneous, for as the opening fills up, the process must become one of diminishing effectiveness. The hole must always fail of being filled by fallen rock, but given such a fall and given a sag in the roof due to lack of support, the hole cannot fail to be filled. Thus support of the main roof beam is assured.

For this reason the main roof probably rarely falls. It merely slumps onto its own débris unless the coal taken out is unusually thick, or the roof submits readily to vertical shear or the cover is light and none too solid.

There are breaks on the surface well over the solid coal—the “draw breaks” as they have been quite reasonably dubbed. They weaken the structure but they do not go any deeper into the roof mass than do the fractures on the underside of the roof in the extracted area. They have nothing whatever to do with the 45-deg. breaks which Mr. Williams so well describes.

In England the students of roof action have believed that in some mys-

terious way the draw fracture which is vertical is connected with the immediate roof fracture which leads away from the draw fracture at 45 deg. This never seemed a possible solution, but why join two fractures that have no common origin? Why assume the roof has any fracture between the top of the immediate roof and the bottom of the original draw fracture near the surface?

The roof therefore breaks *on* the surface but not *to* the surface. It breaks *at* the foot of the cover but not from the top *down* to the coal. An unwarranted assumption has created, as such assumptions do, an insoluble problem. The difficulty is removed by denying the assumption.

Mr. Hall objected to terming the immediate roof when broken a cantilever, for a cantilever is prevented from canting by the disposition of its weight in regard to a fulcrum. The immediate roof which he dubs a “shelf,” because of the manner in which it corbels out from the coal, he declared was a built-in or *encastré* beam having one end confined between the main roof and the coal.

T. M. Chance, consulting engineer, Philadelphia, Pa., declared that invention would improve room and pillar. Three unit mines are to be opened with so few men as not to come under the law which hampers operation with the necessity of making frequent crosscuts. The coal, which is 6 ft. thick, will be brought out by a scraper line. The rooms will be 50 ft. wide with 8-ft. pillars between them. Three rooms, 55 ft. wide, have stood for some years without a fall. The output is expected to be 700 tons in eight hours and 1,400 tons for two shifts. What type of conveyor will be used in the rooms has not been determined.

Mr. Chance quoted one operator as saying: “I can load 100 tons an hour but only 10 tons a week.” That merely exaggerates an experience only too common with improperly organized mechanized operation. The decision regarding the quality of coal to be obtained cannot be shelved. The Elkhorn seam, Mr. Chance said, has a layer of coal with 4½ per cent ash, and a top layer that runs 14 per cent. Mixed, the outcome is a coal with 8 or 9 per cent ash. A condition of that kind makes a choice of methods difficult.

He said that Mr. Williams was suffering much misrepresentation because he had no name for his longwall with steel jacks. The substitution of jacks for timber put an entirely new complexion on the method of operation.

T. F. Downing, Edward V. d'Invilliers Engineering Co., Philadelphia, Pa., said that he had tried mechanized longwall and believed in it still. It failed in his case because of the roof conditions rather than because of any intrinsic weakness. It cost him, because of the roof troubles, 19 to 23c. more to mine coal by longwall than by room and pillar and in the course of the work one man had been killed.

Mr. Downing said, further, that as the mines rarely worked more than 30 per cent of the time the operator would have to consider whether his market would permit him to move his jacks every day, to which Mr. Williams replied that a face with jacks was wholly different from one with timber. He had laid off three long faces for four months. When the order came to resume work, two faces started up without any preparation whatsoever and the third required 48 man-hours to put it in shape because the place had stopped at a fault.

Ohio Section, A.I.M.E., Digs Into Mechanical Mining

(Continued from page 291)

interest in education. Night schools and day technical schools in mining districts offer young men an opportunity to prepare for engineering work. Saturday afternoon and part-time courses at the universities are offered as well as full-time degree and diploma courses. Alternate six-month courses for a degree, meaning six months at the university and six months at the mine, are completed in four to five years.

Following Mr. Shearer's presentation of the British situation, adjournment was taken to the auditorium at Ohio State University. This meeting, at 2:30 p.m., was opened with a 3-reel motion picture showing Jeffrey loading and conveying machines at work in several mines. J. W. Wilson, engineer, Link-Belt Co., Chicago, then described the Simon-Carves coal washing system, American rights for which the Link-Belt Co. recently acquired. “Coal prepared for domestic steam or heating service,” said Mr. Wilson, “may require a complete plant somewhat different from the plant preparing coal for metallurgical use. Yet the units employed

may be identical, while only the arrangement and adjustment of them are suited to the characteristics of coal recovery, refuse and market requirement.

IN COMMERCIAL or domestic coal plants in the past it has been a sort of rule not to wash anything above 3 in. where cleaning plants had been installed, as the sizes above this could be hand picked. With the Simon-Carves washer box we are now able to wash coal up to 5 in., or what would pass through a 5-in. round hole. This will eliminate hand picking of the egg size.

Pointing out the necessity for timber preservation—acute in England and on the Continent of Europe particularly—Alfred Fisher, consulting engineer, New York City, explained the operation of Sarre steel props developed by M. Gascard, of Sarrebrucken, and now extensively used in the Sarre Valley and more recently in British coal mines.

“Varied types of substitutes,” said Mr. Fisher, “have been experimented with in European mines, including concrete, steel, telescopic tubes, sliding wedges,



They Livened Up the Columbus Meeting

Standing, left to right: Frank A. Ray, E. H. Davis, Dr. L. E. Young, Dr. H. Foster Bain, J. W. Wilson, W. J. Shearer and A. R. Anderson. Seated: Ralph H. Sweetser, Col. Frank B. Richards (chairman, Ohio Section, A.I.M.E.), Alfred Fisher and Prof. H. E. Nold.

and sections, but few have been successful in reproducing the yielding resistance characteristic of wood, which is so essential to roof control, in the zone where subsidence takes place immediately following the working face.

"It is claimed by mining engineers in close touch with the development of the application of these props that, offering a yielding and progressively increasing resistance, they gradually absorb the pressure and consolidate the strata, which lessens side pressure.

"Obviously, its greatest service lies in the zone of subsidence following the working face. When roof movement has come to an end or, at any rate, passed its critical stage, there is no longer any need to have this prop employed at that point, and herein lies the economy in its use, as it can be easily removed for use at another place. The prop gives audible warning of its action as the collapsing movement takes place in minute jerks which can be heard.

"Some operators hesitate to use steel props because of first cost," said Mr. Fisher, "but, after all, total cost is the real factor. On this basis one comparison shows a cost per ton of 16.64c. for timber props, 17.6c. for tubular steel and 12.5c. for Sarre adjustable props."

William S. Harman, Columbus, Ohio, was aided in his description of stripping operations at New Straitsville, Ohio, by motion pictures showing shovels in operation removing overburden and loading. "We are now witnessing the introduction of shovels with 20-ft. booms and 12 and 15-*yd.* dippers," said Mr. Harman, and this equipment ought to increase the area of coal subject to stripping and also reduce cost. The introduction of liquid oxygen as an explosive where overburden must be shot also will serve the same purpose.

"Where the country is hilly and two or three cuts can be made with a shovel around the edge of the hill, but not sufficient to remove overburden completely, there is a fertile field for engineering skill to devise plans whereby coal under this remaining overburden may be recovered economically."

Comparing costs of Harmeyford Coal Co. and Penova Coal Co., at Adena,

Ohio, Mr. Harman gave labor, power, supplies and drilling and explosives costs at Harmeyford as \$0.8124 per ton, and those at Penova as \$0.8229. Harmeyford produced 250,000 tons in one year, using electrical equipment; Penova 628,000, tons using steam.

To a question from the floor as to whether he employed union labor Mr. Harman replied: "Yes, we do. On the other hand the figures I have quoted for the Penova Coal Co. are based on non-union labor. It is my belief that the successful coal mine of the future will be operated largely by machinery, and the paramount issue will be to get good dependable help of the right kind, and the price paid will be a secondary consideration."

Following his statement that experiments have been carried on since 1893 to develop mechanical loaders, and a review of the various applications of mechanical equipment, such as entry drivers, pit-car loaders, drags, scrapers and conveyors, Dr. L. E. Young, vice-president, Pittsburgh Coal Co., said:

SUBSTANTIAL progress is being made in mechanical loading in bituminous coal mines. In response to a question asked by the chairman I desire to state that there are at least twenty-eight mines completely mechanical and now operating. Four more mechanical mines are idle on account of labor difficulties or no wage agreement. These mines are in seven states and loading equipment of eight different manufacturers is being used.

"It seems proper to refer to primary and secondary development work. Considerable advance is being made in speeding up primary development by entry-digging machines of several types to take full advantage of the possibilities of concentration of workings. When mechanical devices are used rapid development is absolutely essential. Secondary development must follow rapidly with loading machines, pit-car loaders or conveyors, and all of these types are being applied successfully.

"Mechanical loading devices are being considered not only by companies having thick coal, good roof and no

partings or binders but as well by those which have thin beds, poor roof and coal seams split by layers of impurities. Ingenious devices and practices are being developed to reduce labor and dead work under such conditions. Other obstacles, such as that of being restrained from blasting during working hours, are being overcome by new methods of breaking down the coal. Cleaning plants are being installed to remove impurities from fine coal. In general labor leaders realize that industrial progress means less manual labor and that mechanical loading will make it possible for coal mines to employ high grade men.

"Mechanization means larger tonnage from many mines and larger investment with some increase in fixed charges. There will follow, undoubtedly, keen competition between mines of the new class and the hand-loading mine. However, the increasing use of loading machines during the last five years in such highly competitive districts as Illinois and Indiana indicates that mechanical loading holds considerable promise for the future."

IN THE absence of A. T. Shurick, who had prepared a paper, "The Coal Dilemma and the Bunker," Dr. H. Foster Bain gave a résumé, in which he said that in spite of the apparently pessimistic tone of the writer his general conclusions were hopeful for the industry.

In commenting on the senatorial hearing in Washington and the present status of coal legislation, Harry L. Gandy, executive secretary, National Coal Association, stated that the fundamental question involved is that of constitutional rights. Those who have suggested regulation for the coal industry along lines laid down for the railroads and the public utilities apparently overlooked the power retained by the states to regulate domestic production.

The status of mechanical loading was summarized by James B. Pauley, chairman of the board, Miami Coal Co., and vice-president, National Coal Association, who was the principal speaker at the evening session. A summary of Mr. Pauley's remarks is printed on page 291.

TWO questions were asked by Mr. Pauley and left unanswered, leaving his listeners to ponder over them in connection with the effect of mechanization:

(1) Will not the loader go far to automatically correct overproduction? In many instances loaders are impracticable; hence, if the loader comes into general use, much territory will be automatically eliminated until such later date as additional facilities shall have been developed for economically mining therein and when conditions justify bringing in the additional territory.

(2) If loading machines should be installed in all locations where applicable, will not much of the difference as to cost of production disappear? For, as the proportion of labor to total cost is reduced the scale differential decreases in importance.

The BOSSES Talk it Over



How Vital Is Car Supply?

"**J**IM," said the Old Man by way of beginning his session with the superintendent, "I have here the engineer's time study report of your haulage and miners. Since you started your dispatching system and straightened out your main haulage, he reports that the main-line service to the gathering locomotives is good. Your plan of drilling and shooting for the miner is working out well, but one thing that needs correction is car service to the loaders.

"Your tonnage per loader is low in spite of your improvements. If you eliminate these car delays your tonnage per loader would be about double. The report stresses continuous car supply to the loader at the face. It suggests a two-car room of two tracks or a switch in the breakthrough, but two or more cars per room. It looks as if you can double your tonnage per loader at this mine. If you and Mac will give serious consideration to this problem we can get a larger production, our miners will earn more money, and they will be more satisfied."

"That's all right," answered Jim, "but our natural conditions are different. Conditions prevent our getting a higher tonnage per miner."

"No, sir, Jim," returned the Old Man; "that old alibi of 'natural conditions' has resulted in more high-cost coal mines than any other single cause. Right now let's forget that one."

"But," spoke up Mac, who had joined the meeting, "our miners don't want any more cars; they wouldn't load 'em if they did get 'em. Why, if they don't get

a car just when they want it, out of the mine they go."

"That's just it," returned the Old Man. "Until you remove every legitimate excuse for the miner not working all day the burden of proof is upon you. I don't blame the loader for going home under conditions shown in this report; he loads a car and then waits from 30 minutes to an hour for another one. He repeats that day after day. The miner should have a continuous supply of cars."

"That," said Jim, "would tie up too many cars."

In answer to this the Old Man quoted from the report: "'Human labor is an expensive substitute for equipment.' Therefore," continued the Old Man, "for the want of a few more cars we lose production and the miner loses money. What do you say to that?"

"I don't know how we are going to do it," said Jim, "but we are willing to try. It is easy enough for that engineer to say what to do without having to do it himself. I think a good plan would be for him to show us how to get that car supply."

"All right, Jim," returned the Old Man: "I'll take you up on that. If you will work with this fellow I'll let him stay here. You let him do the studying and planning. To get more tons per loader you have to place more cars per room. Now you put the problem of planning for more production up to him and then back him up with action."

"Well," said Jim, "let him come and I assure you Mac and I will work with him for more production per man."

What method of distributing cars will allow Jim and Mac to increase their tonnage per loader?

Assuming a single-track single-car room, what changes will Jim and Mac have to make to get two or more cars in a room?

Will the required increase in cars be justified by increased tonnage per man and better earnings due to eliminating "waiting for cars"?

Do you believe the engineer's statement that "human labor is an expensive substitute for equipment"?

What do you think of the idea of an engineer who is free from the burden of routine duties studying problems and planning the work for Jim and Mac?

All mining men are urged to discuss these questions.

Letters accepted will be paid for.

What Practical Operating Men Say About "Getting Out the Coal"

Sees Dispatcher a Necessity For Safe, Efficient Operation

A COAL MINE without a telephone system is entirely out of harmony with up-to-date operation. With the working faces one, two and sometimes three miles from the hoisting shaft, it seems unwise to think of trying to operate a mine without a system of party telephones connecting each section with the bottom. Even as a safety measure, where quick communication is required in any emergency, this is the only practical way to get effective results.

Someone may be seriously injured, requiring immediate medical assistance; a main ventilating door may be torn down during the run of the day, with the repairmen in another part of the mine, as usually is the case; a serious wreck may shut off an entire section for a goodly part of the day. These are every-day occurrences in nearly all large coal mines and are imperative reasons why a first-class telephone system should be maintained. Aside from these very tangible reasons, no transportation system can function effectively without an established line of communication.

Judging from the published matter in the pages of *Coal Age*, it is increasingly evident that the handling of mine transportation by a dispatcher is both effective and practical, and is being employed to a greater or less extent throughout the entire country. But the success of such a system hinges on the authority the dispatcher wields and the effectiveness of the signaling devices and telephones. If it is known that a road motor will take a given time to make a section and return, the dispatcher not only must have a mental picture of how the motor is progressing but must have the means of verifying this at intervals.

Another situation has come to my notice. Most coal mines are not overstocked with mine cars, and if the mine is being developed in two or three different directions it is of vital importance to know from which direction the first motor is coming. The empty cars can be placed in readiness for that motor and preclude any possible delay. Those that are handling mine transportation will not have to be reminded that the first motor due on the bottom is not always the first to arrive.

While it is the ideal of mining engineers to apply the railroad system of schedules to coal-mine transportation, the time is not quite ripe for a general application of this much-to-be-desired millennium. Poor track main-

tenance, dirty motor roads and defective couplings are but a few of the retarding influences to be faced.

Where coal has to be hauled any considerable distance—say, a mile or over—with from four to six road motors handling the coal from the inside partings, a dispatcher, aided by telephones and signaling devices, such as have been described in detail in these pages, will be an excellent investment. The dispatcher's prestige will be helped if his position carries with it the authority to make his orders stick. He should, therefore, be a part of the management, and this would imply a good

An ideal transportation system must be based on an equitable handling of an equal average tonnage per man throughout the entire mine. Ample time should be allowed for the loading of each car, and no deviation be made from the rule that the car be loaded to capacity and that the coal be clean and marketable. There is nothing to be gained in hauling a half-loaded car over miles of track when adequate power is at hand to take care of a capacity load. For it takes just as much time to hoist two tons of coal as it does to hoist three tons, where three-ton capacity cars are used.

Many large operations have found it profitable to educate the miners in the best method of shooting coal, and it would make for still greater efficiency if the instruction were carried to the best method of loading the car to prevent it from spilling a goodly proportion of the headers over the motor road while being handled, as well as to insure the car being loaded to capacity.

Jim, Mac and Shorty should by all means install their telephone system immediately and should have a system of red-and-white signal lights placed at strategic positions around the bottom. If they pick an alert, intelligent dispatcher to route the motors the returns will be big. Where the number of cars is limited, keeping track of the cars is an important part of the dispatcher's work, as there is great danger of running out on the bottom, thus seriously crippling the hoist.

With an efficient dispatcher, telephones in working condition in each section and the switchers on their toes, everything else being equal, the mine will reach its highest efficiency and thus make for the greatest economy consistent with practical operation.

ALEXANDER BENNETT.

Panama, Ill.

Mine Phone Installations Gain Steadfast Converts

UNDER the insurance companies' standards all mines were subject to a certain penalty when they failed to maintain a reliable telephone system for the inside operation of their mine. Some very large mines do not have telephones and it was more than interesting to hear their reasons for not having them. Some of the most fantastic tales were told as to the utter impossibility of keeping a telephone in order under the conditions prevailing in the mines; some said the roof was too bad; others said the mines were too damp, while still others said if they had phones they

WHAT is the most important asset a mine manager can possess today? Brains, of course. Ability to think, to observe, to plan. Conditions are changing fast. Are you keeping up? How would you handle the problem stated on the opposite page? Send your solution to the editor.

head, a good education, as well as a fundamental knowledge of mine transportation, so that he can exercise his judgment freely without embarrassment by union obligations.

Many mines have sections closer to the bottom than others, with a shorter and therefore quicker haul. Such sections usually are the fair-haired boys to most mine managers, who are likely to favor them at all times, figuring only in terms of costs per ton rather than a well-balanced haulage system.

An effective operation is one that gets the maximum results out of every unit and dovetails these units into a harmonious machine. The labor end must be considered, as a goodly proportion of our labor troubles arise through utter lack of consideration of the personal equation. And this is not all.

By crowding the tonnage in one section the turn is consequently high and the miners haven't an opportunity to clean their coal properly. The miners in the remote section are disgruntled by the slow turn and, feeling that they are not being fairly treated, are not likely to be very efficient workmen.

would encourage the mine boss to stay on the outside.

When it was suggested that they were able to maintain a trolley line and that other mines were just as damp as theirs and that the very best and most up to date mines wouldn't think of operating without telephones and the mine boss instead of staying on the outside was always found on the inside, they still would insist they were not practical, with emphasis on the tickle.

In these instances it usually is a waste of breath to talk to the men in immediate charge, so the subject has to be brought before someone above them.

Many times have I seen a phone service put in operation and never yet have I known one to fail to give satisfaction where it was given half a chance. In fact the usual result is that the telephone system proves to be of so much help in the movement of mine motor trips that the mine could not even think of trying to operate without one. The installation of a reliable telephone system has never failed to raise the standard of the underground officials and help the entire operation directly as they have learned to use the system.

Welch, W. Va. GEORGE EDWARDS.

Merits of Block Signaling And Phone System Compared

AUTOMATIC signals and dispatching systems with block signaling layouts are departments within themselves that must be given careful study by the management of large producing operations as there are several points to be considered in figuring out contemplated installations in order to make such layouts profitable from an operating standpoint.

There are a number of devices on the market for automatic signaling, some of which operate by the trolley wheel of locomotives; others from a simple contact switch that may be installed in such a manner that it can be operated by the locomotive or mine-car wheels. The latter method is much superior due to the fact that runaway trips, mining machines or any other equipment on wheels entering a signaling zone simply place the system in operation automatically as the wheels coming in contact with the switch connects up the return for the red light located any particular distance from the switch. The system will protect cross entries or any other intersection where protection of this nature may be needed.

The dispatching system by the use of mine telephones is much more valuable where production may warrant the expenditure for such an installation, because a dispatcher not only solves the particular transportation problem but keeps in constant touch with the location of the mine foreman, electrician, mechanic, day workers and any executives within the mine, the number and location of loaders, number of clean-up places in the various sections throughout the mine, the distribution of mine timber, etc. Some operating officials in-

sist that the expense of such a system may be prohibitive, due to high maintenance cost of the telephone but the writer's experience with underground telephones has been that if the phones are kept free from moisture 75 per cent of the maintenance cost is eliminated. This may be accomplished by installing an electric light in each phone which receives its power from the main trolley wire. This will keep the phones dry at all times.

Block signaling systems involve more or less elaborate layouts and require the expense of an operator. Such a system may be able to control the movement of trips and obtain the same transportation efficiency in so far as the movement of coal is concerned as the dispatching system but the operator of the block system cannot keep as fully informed as is possible with the use of mine telephones. Therefore, not only must the merits of such systems be carefully looked into by anyone anticipating the speeding up of transportation but other items must be considered in conjunction with such layouts, some of which are good track and road beds, properly designed side track or terminals, adequate locomotives and mine cars and constant required voltage at distance points. In fact the efficiency of well arranged railroads can well be emulated by the progressive mine executive who wishes to speed up his transportation department.

Adrian, W. Va. C. T. GRIMM.

Phone Enables Mine to Get Most Out of Its Equipment

THE OLD MAN doubtless was right when he told Jim that his haulage system was just a hit or miss proposition. It is plain that little thought had been given to speeding up haulage, since Jim had not even thought of using mine telephones.

One vital question confronting every coal mine in these days of dull markets and careful buyers is how to produce a given tonnage at a low mine cost with as small outlay for equipment as possible. Few mines are furnished with all the cars, locomotives and machines that the foreman thinks he ought to have, hence it is very important that he make the most of whatever equipment he has.

A good starting point is to speed up haulage by going about it in a systematic way. As each mine presents a different problem, it is not possible to lay down any hard and fast rule by which this should be done. If the mine is one producing a large output and necessarily has a complicated haulage system, I believe that a regular dispatcher would work to good advantage. For the smaller mine a modified form of dispatching can be used, I think, to better advantage.

Phones should be installed at convenient places along the haulways and at the tipple or headhouse. Someone employed around the tipple should be designated to answer all phone calls and be responsible for information given

motormen asking for clear track. A similar arrangement usually can be made inside.

With this arrangement a motorman makes up his trip, and when ready to start calls the proper party, who advises him that he has clear track to the outside or to some point pre-arranged where it is possible for two trips to pass.

The above is only a brief and roughly outlined suggestion which would work very well in mines where the haul is not too long and where there are only two or three main-line motors in use. It could, however, be modified to suit almost any small or medium size mine.

The benefits to be derived from a properly installed phone system alone and aside from the haulage question would more than justify the comparatively small expenditure for telephones and wire.

GEO. W. ROSE.

St. Charles, Va.

Telephone, Once Put to Use In Mine, Found Indispensable

IN the transportation system of a coal mine the telephone can play a very important part not only in the direction of the haulage but in the dispatching of orders, transferring of timberman and other labor in emergencies, where time is an important factor in keeping the flow of coal uninterrupted toward the shaft bottom.

Where the various partings are connected with the bottom it is only a matter of a few minutes, on starting work at the beginning of the shift, to ascertain which places can furnish a full trip of coal for the first trip in the morning and the face haulage men can find out how many men are loading and report to the director of haulage, enabling him to direct the placing of empty cars to the best advantage and for the benefit of all concerned. If wrecks or falls on the haulage road occur during the shift the dispatcher can quickly obtain the necessary help to clean up or timber as the occasion demands, in the meantime directing the motors to other places in the mine and keep coal coming so as to not decrease the tonnage hoisted.

During the day as various loaders quit loading, the dispatcher, by keeping a careful check, will be the better enabled to so direct his haulage as to get a larger tonnage by sending the surplus empties and motors where they can be used to the best advantage and not have them lying idle or waiting on one parting for a trip while another parting is standing loaded waiting for empty cars. This system can be taken care of by one man in charge of the switches on the bottom under the direction of the haulage boss, they knowing at all times where the different motors are and when they should arrive.

Not only will the telephone pay on haulage but in the case of a machine, pump, or motor breaking down on the inside it is only a matter of a few minutes for the attendant to step to the

nearest telephone and get in communication with the bottom and have a mechanic on the job in the time it would have taken him to walk out and find one. Then again in case of injury to a man inside, by the use of the telephone a doctor can be notified and be at the mine by the time the injured one could be taken out, oftentimes saving a life that might otherwise have been lost.

If the regular metal mine phone and insulated wire are used and properly installed no difficulties should be experienced through dampness affecting the batteries. By drilling a hole through the case and installing an electric lamp on the inside of the case this can be overcome, as the heat from the lamp will tend to keep out the moisture.

Telephones will pay for the cost of installation in a very short while by increased tonnage and better service by the employees. When they have once been put in you will wonder how you got along without them. J.A.R.

Assistant State Mine Inspector.
Sullivan, Ind.

Safety, Economy and Output Aided by Dispatching System

THERE is no modernly equipped mine with long haulage and two or more main-line or tram motors where a dispatching system for handling transportation will not prove efficient. A large mine is more than compensated by the economy of such a system through the elimination of delays and wrecks, with consequent increase in output, without considering the greatest economy factor of all: safety to personnel and equipment.

A dispatcher should be located at some convenient place where the men check in and out of the mine, so that he will have a knowledge of how many men are inside. An ideal checking system is to have each entry or section check together, with one row of nails or hooks for each entry or section. By this method the dispatcher can tell at a glance at any time how many men are in each section and can distribute the empty cars accordingly.

The telephone system should be so designed and installed that the dispatcher will have communication with all side tracks and such points as assistant foremen's shanties. He also should have full control over the haulage system with authority to decide where each trip should go. If any section is delayed for any reason he should receive a report of it from the motorman or assistant foreman, so that he can prevent delays in other sections by not sending trips of empties to a section that does not need them. All the miners will benefit by such an arrangement.

Jim, Mac and Shorty should get together, study the layout and conditions in their mine and then devise the system best suited to the operation—subject to the approval of the Old Man.

H. T. WALTON.

Wolfpit, Ky.

Mine Dispatching Systems Yield Satisfactory Results

EFFICIENT transportation methods are just as important in coal mining as in railroading. The railroads, from their great experience in hauling materials, which is their principal business, have developed a highly efficient system of transportation whereby con-

gestion and delays are reduced to a minimum. This has been made possible to a great extent by a highly developed system of block signals and dispatching. As the transportation problems in coal mines are to a great extent similar to railroad transportation, but on a smaller scale, the transportation principles of the large carriers are worthy of emulation.

Quite a number of large producing mines, following the dispatching and block-signal systems observed to be working so satisfactorily for years on railroads, have introduced them in a modified fashion into their mines and have found them conducive to increased output and lower costs. The Valier mine of the Valier Coal Co., in southern Illinois, and the Pittsburgh Coal Co. are examples. (*Coal Age*, Oct. 28, 1926, pages 593-599, and November, 1927, pages 265-267.)

L. W. Brown, in a paper read at a recent meeting of the West Virginia Coal Mining Institute, stated that the installation of a telephone system in a mine is not an item of great cost. The regular telephones for inside mine use will cost from \$40 to \$45 each, and the lines under ordinary conditions can be installed for approximately \$200 per mile, including labor and material. This estimate is based on two strands of No. 14 R C copper wire, strung on glass insulators and regular brackets. Installation of this equipment was found to give very satisfactory results. The upkeep of underground lines, he said, will not exceed \$1 per mile per day, and added that such a system properly installed and intelligently used will add at least 10 per cent to the efficiency of the plant. These estimates were based on actual experience.

When consideration is given to the numerous advantages that are gained, such as generally increased efficiency of the entire organization throughout the mine, added safety and general contentment of the miners and workers in general and the nominal cost of installation, I am of the opinion that the use of systems of dispatching and telephonic communication, which can be modified and adapted to the different conditions in various mines, is a move in the right direction.

J. W. POWELL,
Consulting Mining Engineer.
Welch, W. Va.

Publications Received

Fifty-nine Coal-Mine Fires, by G. S. Rice, J. W. Paul and M. W. von Bernewitz. Bureau of Mines, Washington, D. C. Bulletin 229. Price, 40c. Pp. 156; illustrated. Abstracts and reviews essential details of reports on 59 fires in different coal mines in the United States, and describes methods of controlling or extinguishing them.

Coal in 1925, by F. G. Tryon and L. Mann. Bureau of Mines, Washington, D. C. Price, 25c. Pp. 140; tables.

Anthracite in 1926, by F. G. Tryon and H. L. Bennit. Bureau of Mines, Washington, D. C. (Excerpt from Mineral Resources of the U. S., 1926—Part II.) Price, 10c. Pp. 39; tables.

WORD from the FIELD

Industrial Coal Reserves Continue to Decline

Coal stocks in industries in the United States continued to shrink in March, showing a further decline of approximately 1,600,000 tons on April 1, as compared with March 1, 1928, according to a report by the National Association of Purchasing Agents. Consumption increased to 38,250,000 tons, which is nearly 2,000,000 tons increase in March as compared with February, but this was largely due to the increased number of days in the month. Coal stocks are now 41 per cent lower than a year ago, when stocks reached their peak in preparation for the strike of 1927.

DAYS' SUPPLY OF COAL ON HAND IN VARIOUS INDUSTRIES

Byproduct Coke	36
Electric Utilities & Coal-Gas Plants	57
Railroads	38
Steel Mills	24
Other Industries	36

COMPARATIVE ESTIMATES OF OUTPUT, CONSUMPTION AND STOCKS (In Tons)

	U. S. Industrial Output	On Hand in Consumption Industries
June	41,999,000	36,690,000
July	38,697,000	33,560,000
August	48,907,000	33,900,000
September	48,592,000	33,195,000
October	51,400,000	35,813,000
November	47,100,000	35,514,000
December	47,309,000	37,225,000
January	49,645,000	37,678,000
February	46,933,000	36,301,000
March	49,452,000	38,268,000
April 1		45,744,000

Robert V. Norris Dies

Robert Van Arsdale Norris, one of the most eminent engineers in the anthracite field, died April 20 at his home in Scranton, Pa. He had been ill about a month.

Born in Newark, N. J., May 2, 1864, he was graduated from Columbia School of Mines with the degree of mining engineer in 1885. After graduation he was assistant instructor in mining and surveying at the School of Mines. Following this work he was engaged for a short term as inspector of dredging for the United States Government, and later in the federal employ as chemist.

In June, 1886, Mr. Norris was made assistant engineer of coal mines for the Pennsylvania Railroad Co. (Susquehanna Coal Co.). In 1893 he was promoted to principal assistant engineer for the same company, and in 1900 he was advanced to the position of chief engineer, in which capacity he served until 1904, when he left the company and engaged in private practice. Since that time he had been engaged as consulting engineer for the large coal companies. He was lecturer on coal mining

at Harvard University, also graduate lecturer at Columbia University, New York. He was senior member of the firm of R. V. Norris & Son, consulting engineers.

During the World War Mr. Norris served as engineer to the United States Fuel Administration and as a member of the price-fixing commission of the War Industries Board.

Honnold Bureau Dissolves

The Honnold Coal Bureau, Fisher Building, Chicago, of which Dr. F. C. Honnold was manager, ceased activities permanently on April 30. Temporary offices will be maintained at the old address, however, for several months. Dr. Honnold has not announced his plans other than that he will devote the summer largely to vacationing.



Dr. F. C. Honnold

Gas Pocket Killed Eight

A coroner's jury on April 9 found that the fatal Keystone (W. Va.) mine explosion of April 2, which took a toll of eight lives, was caused by a pocket of gas which had been liberated by a fall of slate. The inquest was conducted by Dr. H. G. Camper, McDowell County Coroner. Thomas Stockdale, W. D. Lee and officials of the Keystone Coal & Coke Co., owner of the mine, and Robert M. Lambie, chief of the State Department of Mines, assisted in examining the witnesses.

Peabody Takes Over 11 Mines In \$44,000,000 Merger

A consolidation of the Peabody and Insull coal interests whereby the Peabody Coal Co. takes control of eleven mines owned by Illinois utility companies was announced in Chicago April 8. The mines affected were owned by the Commonwealth Edison Co., Peoples Gas Light & Coke Co., Public Service Co. of Northern Illinois and the Middle West Utilities Corporation. These mines in the past have been operated by the Peabody company under a management contract, so that their status has not been materially changed.

The utility companies in turning over the eleven mines, with approximately 52,000 acres of land, take stock of the consolidated company in payment. As a result of the merger the Peabody Coal Co. will own 23 mines located in Illinois, Kentucky, Virginia, West Virginia and Indiana, and in addition will operate for other companies thirteen mines located in Illinois, Kentucky and Pennsylvania.

The company announced April 27 that it had sold an issue of \$12,500,000 first-mortgage sinking-fund 5 per cent bonds to Halsey, Stuart & Co. In connection with this announcement it was stated that Samuel Insull would become chairman, and Stuyvesant Peabody, president of the company. Directors are: D. S. Boynton, C. D. Caldwell, B. A. Eckhart, C. S. Ellis, George F. Getz, John Hertz, M. E. Keig, D. F. Kelly, Frank G. Logan, James A. Patten, Stuyvesant Peabody, M. F. Peltier, William N. Pelouse, Edwin W. Sims and William Wrigley, Jr.

Air Cleaner for Newhall Mine

The New River & Pocahontas Consolidated Coal Co., a Berwind-White interest, recently purchased for the Newhall mine, in West Virginia, a pneumatic coal-separation plant having a capacity of 200 tons per hour. The new equipment will be supplied by the American Coal Cleaning Corporation, which put in a similar plant at another mine of the same company about four months ago.

New Haven Receives Bids

Prices ranging from \$4.58 to \$5.37 per ton were submitted to the New York, New Haven & Hartford Railroad Co. by eight bidders on April 20 for furnishing and delivering to the company's pier at Boston between 200,000 and 225,000 net tons of high-volatile mine-run bituminous coal during the period May 1, 1928, to May 1, 1929.

Senate Committee Brings Out Costs and Sales Realizations of Operators

WASHINGTON, D. C., April 25.— Examination of witnesses in the hearings before the Senate committee on interstate commerce under the Johnson resolution which calls for an inquiry into conditions in the soft-coal fields of Ohio, Pennsylvania and West Virginia was resumed April 16, after a prolonged battle over the power of the committee to compel the production of cost and sales data had ended in a sudden compromise.

The challenge of the committee's authority was made during the closing days of March when counsel for southern West Virginia operators insisted that the committee was without legal right to demand the submission under subpoena of the following information:

(1) Total tonnage, cost of production, labor cost and sales realizations on all coal produced, mined and marketed from 1923 to 1927;

(2) Amount of tonnage sold and delivered to railroads and prices received therefor during the same period;

(3) Names of railroads to whom coal was sold and the amount sold to each carrier.

WHEN the hearings were reconvened on April 9, the arguments of opposing counsel were renewed while coal operators from the affected areas cooled their heels in the committee chambers. Meeting in executive session on the morning of April 16, however, the committee unanimously adopted the following resolution sponsored by Senator Pittman of Nevada:

Resolved, That the committee, in compliance with the resolution of the Senate, for the purpose of obtaining facts and expert testimony relative to the coal industry, and particularly with regard to the relations between the industry and interstate common carriers (and not with the intent to investigate an intrastate corporation), and to enable the United States Senate to initiate legislation within its jurisdiction looking to the remedying of the deplorable situation now existing in such industry, shall require officers, agents of coal companies, or other witnesses subpoenaed to testify before the committee, to make full and complete response to the following questions, to wit:

(1) Wages paid various classes of laborers employed in and around mines from 1920 to 1927, inclusive.

(2) Total tonnage produced, total cost of production and total sales realization on all coal produced, mined and marketed from 1923 to 1927, both inclusive.

(3) Total amount of tonnage sold and delivered to railroads by years from 1923 to 1927, and total realization therefrom.

(4) Names of railroads to whom coal was sold, and the tonnage sold each.

(5) Sample or copy of standard employment contracts entered into between the company and its laborers and employees in and around its coal mines.

(6) Sample or copy of house leases now in use between the company and employees.

(7) Amount expended for watchman around the mines from 1920 to 1927.

A. M. Belcher, of counsel for the West Virginia interests, and William P. Belden, representing the Ohio operators, announced that they had no objection to the committee's asking the questions embodied in the Pittman resolution. John M. Lewis, international president, United Mine Workers, stated that his organization was "quite willing to accept the arrangement and comply with the wishes of the committee."

D. W. Boone, president, New River Export Smokeless Coal Co., who was testifying when the issue was raised in the hearing on March 29, again took the stand. He maintained that his employees were well satisfied with the existing scale of wages ranging from \$2.98 to \$5 for a 10-hour day. Only a few, he said, worked under the minimum scale.



J. G. Bradley

The average wage was between \$3.50 and \$3.75. He did not think his men would want an 8-hour day unless they received as much as they are now getting for the longer day. He defended living conditions in his community.

THE witness said, in response to a question from counsel for the union, that he had reduced wages last November without making any inquiry to determine the prevailing rates in the New River field although the contract of employment with the men specifies that they shall receive the average of the field. His statement of sales showed a loss of over \$200,000 the past five years on the production of less than 500,000 tons. His company sells very little coal to the railroads, he said, but such sales had shown a profit.

James D. Boone, J. D. Boone Coal Co., testified that the first coal had been shipped on May 10, 1924, from his mine at Boonesboro. At that time the machine rate was 45c. per net ton and day rates ranged from \$4.50 to \$5.85 for a 9-hour day. These rates were cut on Nov. 1, 1927, to 40c. for machine tonnage and \$3.60 to \$4.68 on day rates. He also submitted figures showing his operations had been conducted at a loss.

The last witness of the day was J. G. Bradley, president, Elk River Coal & Lumber Co., who declared that the miners' union had dwindled "to a mere oligarchy of office-holders raising a wail for the power" and revenues that are gone. Its record of failure is the most stupendous in labor history. It only seems to have brought disaster" to the

operators who have entered into contracts with it, and misery and poverty to the rank and file of its members.

Mr. Bradley said that union tonnage had shrunk from 65 per cent of the bituminous output of the country at the beginning of 1922 to 23 per cent at the end of 1927 and a still smaller percentage this year. To demand that wages he adjusted to carry an army of 200,000 extra men would mean asking the public to assume an additional burden of \$250,000,000 annually on its fuel bill, declared Mr. Bradley.

THE witness took issue with those who cry overproduction, asserting that displacement by other forms of power-producing energy explains the failure of the country to absorb the product of present developed mine capacity. West Virginia's expansion in output in recent years, he said, has been due to the elimination of the union in that state.

"The industrial condition which exists between employers and employees in West Virginia is a generation ahead of the obsolete rule-or-ruin unionism exemplified by the United Mine Workers. They meet their problems together and share the good and bad with fortitude." The union, he added, has placed itself outside the pale of those who are entitled to claim the protection collective bargaining affords.

Mr. Bradley stated that his mines had operated in Clay County, West Virginia, without the loss of a day because of labor difficulties in 24 years. "In a period of seven years the four states in the Central Competitive Field have lost in tonnage from strikes alone 215,000,000 tons and a correspondingly crushing loss of wages to the miners involved."

Using figures compiled by the National Industrial Conference Board, the witness stated that the low wage for skilled labor in 27 selected industries was 54.1c. per hour and the top wage 95.6c. and the average was 63.6c. Unskilled labor received 25.3c. to 53.6c. and an average of 45.3c. The average earnings of both skilled and unskilled labor in a group of Kanawha mines ranged from 59.5c. in 1924 to 70.7c. in 1926 as against 57.3c. to 67.2c. in the three years 1921-23, when these mines were operating union.

FOR his own company he showed average earnings per man per year of \$1,829.94 in 1923 and \$1,692.17 in 1927; the average per hour was 74c. in 1923 and 71c. in 1927. Last year 55 per cent of the payroll was paid in cash; the deductions covered rent, coal, water, lights, merchandise and other items furnished the men at their request "at prices satisfactory to them." There is no attempt, he declared, to force men to trade at the company store.

Mr. Bradley also challenged statements of union witnesses that union labor was more efficient. Against an average production per man per day of 4.52 tons for all mines in 1925 he cited 10.97 tons at Island Creek operations and 7.2 tons at his own mines.

Continuing his testimony on April 17,

Mr. Bradley filed statements showing wage scales in effect at his company operations since Jan. 1, 1920. There have been five changes since that time—two advances and three reductions. Day rates under the first scale ranged from \$3.50 for unclassified labor to \$7.15 for motormen; under the latest scale the range was from \$3.15 to \$5.75, with despatchers, who had received \$7.15 under the first scale, now receiving \$7, machine runners cut from \$7.15 to \$6 and blacksmiths from \$6.40 to \$6.

The witness provoked the ire of Senator Wheeler when, commenting upon a criticism of a lease form for company houses in Fayette County, Pennsylvania, embodied in the report of the U. S. Coal Commission, Mr. Bradley said that he thought the "statement was either written by one of those lady uplifters with a facile pen or perhaps by Dr. Devine, who is an intellectual Jew and has a slant which that sounds very much like."

"I suppose," remarked the Senator from Montana, "you refer to Dr. Devine as an intellectual Jew and as one of these uplifters because of the fact that

Christ himself was one of the first uplifters and was a Jew. Is that the idea?"

"I have no answer to that."

Pressed further by the Senator, the witness denied that he had intended to cast any reflections upon the Jewish race. Senator Wheeler stated that Dr. Devine, who was a member of the U. S. Coal Commission, is a prominent Methodist. Mr. Bradley said that he had not known that.

Later the witness affirmed a belief in collective bargaining, but demanded "intelligent" labor leadership. He denied that lower wage scales had been responsible for a great part of the shift in business to the Southern fields, saying that the shift had started when "we were all paying top wages." In his own case he admitted that it had been wages which had raised or lowered his cost of production.

Wrangles between the witness and Mr. Lewis were frequent. The president of the United Mine Workers registered vigorous objection to the statement that the union was a Communistic organization, pointing out that the ex-

pression in the preamble of the union constitution that the workers demanded "the full social value" of their labor had been changed back to an "equitable share" of the value of the product of its industry.

Union spokesmen also took issue with the implication that the union was responsible for bringing in 200,000 extra workers or that it wanted them kept in the industry. Objection likewise was made to loading the union with full responsibility for the tie-ups in organized fields in 1922 and 1927.

The charge that Northern operators and the union had launched a conspiracy in 1898 to kill Southern competition was injected into the hearing by Langdon C. Bell, a director of the Red Jacket Consolidated Coal & Coke Co., who stated that his company's operations, like those of Mr. Bradley, always had been operated non-union. Part of the effort to stifle West Virginia has been directed toward attempts to make the state union; part to forcing unfair freight differentials on the Southern coal.

Workers at the Red Jacket and Red Jacket Jr. company mines last year, said Mr. Bell, averaged 261 days, receiving an average of \$122.25 per month or \$5.62 per day. The witness denied that the company's treatment of its workers could be properly criticized. Organized in 1907 the Red Jacket has never paid a dividend on its common stock and only two dividends of 6 per cent on its preferred issue. In four years it has redeemed \$151,000 out of an outstanding bond issue of \$1,097,000 and its surplus account on Dec. 31, 1927, showed a deficit of \$1,753,417.88.

"It has paid its labor not what it would have liked to pay but all that it could pay reasonably under the circumstances. Whenever there has been a period of prosperity in the coal industry it has increased its wages. Whenever it has been necessary it has reduced them and, generally speaking, whenever it has reduced its wages its men have willingly acquiesced."

IF CONGRESS has the power, Mr. Bell thought it would be proper and beneficial to have the government prohibit carriers from forcing coal companies to sell them railroad fuel at less than the cost of production. The witness, however, had no reason to believe the railroads were engaged in a conspiracy to depress prices, but he conceded the carriers were in a position to force down quotations by setting one producer against another.

Mr. Bell defended individual agreements and criticized those who referred to them as "yellow-dog" contracts. "We would," he said, "resent the use of the term were it not the harmless vaporings of chagrin and defeat." Senator Wheeler retorted that the operators were using economic pressure on the man needing work. They might, he argued, just as well make religion a condition of employment as non-membership in a union.

"They are setting themselves up as dictators as to what my political, religious and social affiliations shall be," declared the Senator, "and I say that that

Production, Costs, Realization and Railroad Fuel Sales of Selected Ohio and West Virginia Companies—1923-27

(Based on Statements Filed with Senate Committee on Interstate Commerce)

J. D. BOONE COAL CO.

Year	Tons Produced	Production Cost	Realization	Railroad Sales, Tons	Realization
1924	28,459	\$52,288.16	\$36,061.14	.....	.....
1925	54,757	89,787.79	71,960.66	.....	.....
1926	63,599	106,001.22	95,118.69	.....	.....
1927	58,566	99,589.34	75,189.78	.....	.....
Totals	205,381	\$347,666.51	\$32,056.92	.....	.....

CABIN CREEK CONSOLIDATED COAL CO.

1923	740,458	\$1,885,017.52	\$1,931,188.51	94,565	\$252,989.05
1924	860,467	1,702,606.05	1,519,154.49	155,137	267,714.60
1925	1,080,192	1,792,146.55	1,747,426.60	162,678	256,427.30
1926	1,171,777	1,955,324.28	2,174,232.22	120,892	192,315.75
1927	1,366,203	2,053,539.73	2,368,996.00	118,450	164,950.35
Totals	5,219,097	\$9,388,634.03	\$9,700,997.82	651,722	\$1,134,397.05

CAMBRIDGE COLLIERIES CO.

1923	1,874,204	\$4,804,985.38	\$4,974,838.82	1,551,755	\$4,056,726.70
1924	1,683,722	4,127,108.87	3,654,566.03	1,577,431	3,243,450.11
1925	318,783	1,313,018.63	593,014.44	298,867	517,110.23
1926	307,974	1,234,030.14	678,666.56	260,839	404,015.98
1927	211,551	962,149.55	453,217.25	184,093	586,100.81
Totals	4,396,234	\$12,441,292.57	\$10,356,303.10	3,872,985	\$8,807,404.03

CLARKSON COAL MINING CO.

1923	813,469	\$2,102,935.89	\$1,798,883.17	500,780	\$1,121,747.65
1924	1,147,261	2,653,330.87	1,999,455.05	500,472	945,892.27
1925	894,285	1,908,693.37	1,557,132.78	367,545	713,037.40
1926	858,782	1,924,263.83	1,504,521.67	315,038	563,918.47
1927	297,950	953,627.93	521,131.63	98,313	205,475.06
Totals	4,011,747	\$9,542,851.89	\$7,381,124.30	1,782,148	\$3,550,070.85

ELK RIVER COAL & LUMBER CO.

1923	615,487	\$1,421,774.97	\$1,747,985.08	.....	.....
1924	659,625	1,259,883.75	1,339,048.75	540	.....
1925	706,679	1,286,155.78	1,385,090.84	6,434	.....
1926	719,478	1,388,592.54	1,474,929.90	13,554	.....
1927	771,697	1,643,714.61	1,666,865.52	3,011	.....
Totals	3,472,966	\$7,000,121.15	\$7,613,920.09	23,539	.....

ISLAND CREEK COAL CO.

1923	2,863,245	\$6,399,259.67	\$8,550,174.87	1,210,919	\$4,287,188.91
1924	4,989,315	7,069,540.10	8,733,926.57	919,614	2,194,794.81
1925	5,976,519	7,854,751.50	9,264,957.55	715,731	1,095,711.16
1926	6,482,310	8,904,464.88	10,587,199.04	575,896	878,779.07
1927	7,312,492	9,403,074.64	12,119,471.91	585,633	892,032.82
Totals	27,623,881	\$39,631,090.79	\$49,255,729.94	4,007,793	\$9,348,506.77

NEW ENGLAND FUEL & TRANSPORTATION CO.

(Federal No. 1 Mine)

1923	589,260	\$1,307,571.02*	\$1,528,641.81	133,388	\$277,944.83
1924	228,527	578,776.95*	484,569.08	107,814	189,451.38
1925	614,476	1,225,403.57*	1,048,520.38	137,953	208,421.82
1926	885,932	1,497,204.21*	1,657,819.32	134,220*	205,427.29
1927	979,713	1,559,849.00*	1,680,157.71	185,363	272,593.21
Totals	3,297,908	\$5,968,804.75*	\$6,399,708.30	698,738	\$1,153,838.53

Exclusive of taxes, general expense and management overhead.

is subversive to the best principles upon which this government of ours was founded."

The witness reiterated the conspiracy charge against the union in his defense of individual contracts. During the cross-examination on this point Senator Wagner of New York remarked that if the purpose of the activities of the union had been to improve the conditions of the fellow-workers of the organization that would be recognized as a legal effort. "And if that is their purpose," he added, "it is difficult to find a conspiracy in it to destroy business or curtail production; that is, if it should incidentally result in that, there would be nothing illegal about that."

THREE has been no demand for a checkweighman, asserted Mr. Bell. "Our employees are satisfied. They are not satisfied with the wages they receive from us and we are not satisfied with the wages we are paying them. We would like to pay them more." The witness was firm in his conviction that the operators were fully justified in keeping union organizers and union propaganda out of their territory.

George A. G. Wood, vice-president, New England Fuel & Transportation Co., the last witness heard on April 18, submitted wage schedules showing five changes since 1920. Pick-mining rates had jumped from 65c. per ton on Jan. 1, 1920, to 89c. on April 1, 1920; the present rate is 65c. Inside day labor received \$4 to \$4.64 under the Jan. 1, 1920, scale, and now gets \$4.40 to \$5.16; during the boom period from Sept. 1, 1920, to March 31, 1924, the rates ranged from \$6.82 to \$7.44. Outside labor was paid \$4 to \$6 at the beginning of 1920. The average earnings per man per day at Federal No. 1 last year was \$6.05; this mine worked 291 days.

Mr. Wood stated that his company has never employed deputy sheriffs or contributed to any fund for their maintenance. Payment for watchmen and other forms of property protection at Federal No. 1 was \$1,912.24 in 1920, \$58,188.91 in 1925 and \$22,569.68 last year. At the No. 3 mine payments ranged from \$204.17 in 1920 to \$19,292.08 in 1925.

"This investigation of the coal industry," declared William H. Coolidge, chairman of the board, Island Creek Coal Co., at the beginning of his testimony April 19, "has been ordered by the Senate at the request of the United Mine Workers, who desire that the cost of coal to 100,000,000 people in the United States shall be increased for the benefit of 500,000 coal miners and their families and possibly 100,000 people who are owners and stockholders in coal companies. Heretofore investigations have been ordered because the people were alleged to be paying too much for their coal. This investigation is being held to see if some way can be found, within the Constitution, to make coal production cost more. We have not believed this matter was within the control of the federal government, but so far as

possible we desire to help this committee in considering the question."

Mr. Coolidge traced the organization and development of the Island Creek company, emphasizing the housing, sanitary and living conditions afforded the workers and the safety records of the company. Against a country record of 299,599 tons per fatality last year, the Island Creek reported only one death per 1,232,997 tons produced. In so far as his company was concerned the statement of Mr. Lewis that West Virginia wages from \$1.90 to a maximum of \$4.50, he said, "was absolutely wrong."

In 1927, according to Mr. Coolidge, approximately 50 per cent of the Island Creek workers worked at a rate

of \$6.80 per day, 15 per cent at \$7.30 to \$10.80, 4 per cent at \$6 to \$6.72, 16 per cent at \$5.04 to \$5.68, 5 per cent from \$4.56 to \$4.96, 9 per cent from \$4 to \$4.40 and only 1 per cent at a rate of less than 50c. per hour. The average rate per hour is 80c.

The witness also submitted the same schedule of wages in various industries compiled by the National Industrial Conference Board and offered in evidence by Mr. Bradley and Mr. Wildermuth. T. C. Townsend, of counsel for the union, pointed out that the list did not include the highly organized industries such as bricklayers, carpenters, plasterers and plumbers. Mr. Coolidge was not ready to charge high wages

Production, Costs, Realization and Railroad Fuel Sales of Selected Ohio and West Virginia Companies—1923-27

(Based on Statements Filed with Senate Committee on Interstate Commerce)

NEW RIVER CO.

Year	Tons Produced	Production Cost	Realization	Railroad Sales, Tons	Realization
1923	1,705,034	\$5,702,145.20†	\$6,111,523.86	10,609	\$44,823.19
1924	1,702,800	4,286,628.72†	3,808,844.72	10,430	29,082.06
1925	2,175,390	4,769,760.11†	5,016,884.41	7,935	19,837.50
1926	2,572,859	5,913,201.83†	6,371,428.02	6,374	16,732.99
1927	2,569,766	5,817,950.22†	5,818,721.15	5,990	14,975.00
Totals	10,725,849	\$26,489,686.08†	\$27,127,402.16	41,338	\$125,450.74

† Includes selling commission.

NEW RIVER EXPORT SMOKELESS COAL CO.

1923	75,154	\$367,803.06	\$409,589.30	.....	.....
1924	90,718	371,143.08	228,609.36	.....	.....
1925	114,408	342,295.20	239,263.20	.....	.....
1926	120,049	344,543.50	286,991.50	.....	.....
1927	56,615	120,023.80	155,691.95	.....	.....
Totals	457,994	\$1,546,609.06	\$1,320,072.61	.....	.....

** Included in 1926 figures.

OHIO COLLIERIES CO.

1923	1,759,628	\$4,086,255.00	\$3,941,664.00	694,000	\$1,690,726.00
1924	1,220,253	2,699,392.00	2,326,590.00	753,000	1,459,488.00
1925	1,221,892	2,587,817.00	2,218,039.00	692,000	3,185,000.00
1926	1,239,999	2,673,819.00	2,346,115.00	647,600	1,378,000.00
1927	498,537	1,043,414.00	963,864.00	**	**
Totals	5,940,312	\$13,088,697.00	\$11,796,273.00	2,776,600	\$7,713,214.00

** Included in 1926 figures.

POCAHONTAS FUEL CO.

1923	3,211,663*	\$8,940,268.83	\$11,256,605.47	12,710*	\$43,178.39
1924	3,811,244*	7,485,475.67	7,948,038.46	1,071*	2,658.79
1925	4,235,330*	7,273,782.93	8,515,638.24	46,701*	98,822.06
1926	4,488,453*	8,155,797.65	10,279,936.74	64,075*	141,323.59
1927	3,982,187*	7,211,695.19	8,487,867.46	39,577*	81,295.85
Totals	19,728,871*	\$39,067,020.27	\$46,488,086.37	164,134*	\$367,278.68

* Gross tons.

RED JACKET CONSOLIDATED COAL & COKE CO.

1923	497,298	\$1,164,671.92	\$1,108,477.24	24,014	\$42,278.75
1924	750,466	1,269,038.00	1,106,937.35	162,642	251,516.73
1925	1,026,133	1,576,140.28	1,452,994.32	232,744	378,788.27
1926	1,196,584	1,894,192.05	1,858,296.50	321,349	489,182.44
1927	1,228,474	2,169,945.00	1,941,665.63	740,739	\$1,161,766.19
Totals	4,698,955	\$8,073,987.25	\$7,468,371.34	1,010,266	3,413,182.61

1923	951,195	\$2,485,842.00	\$2,367,709.00	237,428	\$559,135.93
1924	1,030,516	2,377,169.00	2,175,515.00	307,937	689,156.68
1925	1,001,254	2,337,239.00	2,186,154.00	345,912	778,308.28
1926	1,240,468	2,890,422.00	2,563,264.00	498,719	1,076,169.02
1927	372,376	824,871.00	792,079.00	134,010	310,411.70
Totals	4,595,809	\$10,915,543.00	\$10,084,721.00	1,524,006	3,413,182.61

SUNDAY CREEK COAL CO.

1924*	1,064,057	\$2,208,679.00	\$2,319,503.00	157,289	\$308,477.00
1925*	474,440	984,918.00	943,335.00	136,600	294,169.00
1926*	830,042	1,655,952.00	1,612,606.00	273,695	559,324.00
1927*	909,385	1,761,808.00	1,722,690.00	349,355	727,657.00
Totals	3,277,924	\$6,611,357.00	\$6,598,134.00	1,010,266	\$2,086,943.00

* Figures for total output, costs and realizations are for years ending March 31; railroad data cover sales by calendar years 1923-27, inclusive.

WARNER COLLIERIES CO.

1923	620,636	\$1,698,060.10	\$1,985,414.56	386,557	\$1,244,713.54
1924	402,945	969,465.67	896,552.63	286,118	669,516.12
1925	3,701,998	6,682,106.39	5,560,401.00	659,235	1,034,998.95
1926	4,168,670	7,478,593.98	6,669,872.00	494,200	721,532.00
1927	3,750,488	7,088,422.32	5,779,502.01	925,900	1,425,886.00
Totals	12,684,737	\$23,916,668.46	\$20,891,742.20	2,752,010	\$5,096,646.63

with the full responsibility for the increased cost of living, but flatly denied the claim of Senator Wheeler that watered stock was the chief cause.

Mr. Coolidge pointed out that luxuries of a few years ago were considered necessities today. This increased the cost of living, but he did not condemn the higher standards. High wages, he said "have been a great help to the country." He would not dispute Senator Wheeler that organized labor had played a big part in raising wages and living standards. He was inclined to give church and social bodies the major credit for promoting humanitarian and labor legislation.

Reverting to the question of earnings, Mr. Coolidge at the afternoon session submitted figures showing that in 1926 only 36 out of 1,661 workers whose names appeared on every payroll for the year had received less than \$1,000; these were old men who worked irregularly. A second division showed 461 receiving between \$1,000 and \$1,500; 673 men received between \$1,500 and \$2,000; 314 between \$2,000 and \$2,500, 128 between \$2,500 and \$3,000, 43 between \$3,000 and \$3,500 and 6 between \$3,500 and \$4,000. In 1927 there were 25 in the lowest group, 498 in the \$1,000-\$1,500 class, 609 in the \$1,500-\$2,000 class, 283 in the \$2,000-\$2,500 class, 78 in the \$2,500-\$3,000 class, 48 in the \$3,000-\$3,500 group and 11 in the \$3,500-\$4,000 group. Average earnings were \$1,801.47 in 1926 and \$1,784.35 in 1927.

UP UNTIL 1922, said the witness, the mines had been run as open-shop, with no inquiry made as to union affiliations. Since that time, as a result of union activities in Logan and Mingo counties, the wage agreement with the men prohibits membership in a labor organization. Mr. Coolidge introduced into the record the telegram of Mr. Lewis to W. J. Sneed prior to the Herrin massacre, the Blocton (Ala.) "rattlesnake" speech of Van Bittner, briefs filed by the non-union operators with the U. S. Coal Commission and excerpts from the testimony in the Paint Creek investigation in 1913. Since 1920, he said, the Island Creek company has expended \$118,191.64 for watchmen.

Lee Ott, one of the three receivers of the West Virginia Coal & Coke Co., which operates some properties adjacent to the Island Creek mines, followed Mr. Coolidge on the stand late in the afternoon and concluded April 20. His initial testimony was devoted to wage schedules, sales and costs in accordance with the terms of the Pittman compromise resolution. As shown in the table on page 317, the company has been losing steadily since 1923. The company records, said Mr. Ott on April 20, do not disclose the employment of watchmen in its northern district; in the southern field it had paid \$3,123 in 1926 and \$3,000 last year.

Samuel D. Brady, president, Brady-Warner Coal Corporation, reviewed the operating and financial troubles of that



Ezra Van Horn

company, which now is in the hands of receivers. He stated that conditions made it impossible to renew the union contract on its expiration in the spring of 1924. He admitted that he had evicted a number of families from company houses without a court order. Mr. Brady stated he believed he was justified in this action and this led to an extended cross-fire between witness, counsel and committee members as to the law in West Virginia, court decisions and what constituted a breach of peace in attempting evictions. The remainder of his testimony was devoted to a résumé of armed conflicts and court proceedings growing out of the break with the union.

IN 1920, testified Josiah Keely, president and general manager, Cabin Creek Consolidated Coal Co., his company had an average cost of production of \$2.73 per ton and an average realization of \$4.05. In 1921 the average cost was \$3.46 and the average realization \$3.23; in 1922 the average cost was \$4.56 and the average realization \$3.60. The figures for 1923-27 appear elsewhere. In the last eight years, said the witness, the Cabin Creek company has paid off over \$1,000,000 in bonds out of earnings.

Day wages at the beginning of 1920 ranged from \$2.30 for boy trappers to \$4.68 for machine runners; the peak range, \$3.65 to \$7.18, was in effect from Aug. 16, 1920, to April 1, 1924; since that time the range has been from \$2.40 to \$4.80. In a formal statement presented to the committee Mr. Keely recited the labor history in the Cabin Creek district. The right to hire and discharge under union conditions, he said, was only a paper right. Illegal bonuses were defended by union officials who sought to make them permanent. "From 1914 to 1922 there were murders, robberies, gambling on the porches of company buildings, drunken brawls, beatings, blackmail and disturbance of public worship.

The union oath was a protection for criminals in every resort to law."

Robert H. Gross, president, New River Co., filed statements showing wage scales had been raised four times and reduced three times since Jan. 1, 1920. The day rates in effect last year ranged from \$4.10 to \$4.68 for inside labor and from \$4 to \$5 for outside labor. At the beginning of 1920 inside labor received \$4.76 to \$5.38 and outside labor \$4.56 to \$5.70. The top scales, paid three times during the eight years, ranged from \$6.60 to \$7.18 for inside labor and \$6.50 to \$7.50 for outside work. Pick mining rates were 70.1c. per net ton at the beginning of 1920 and 59.11c. at the close of last year.

SINCE April, 1917, the company has paid \$5,510,000 in dividends on a preferred stock issue of approximately \$7,000,000. No dividends have been paid on the common stock, bonded debt has been cut from \$4,000,000 to \$2,000,000 and about \$2,000,000 has been ploughed back into the property, said Mr. Gross. During 1927 the mines averaged 263.85 days and the workers, \$1,469.64 as gross earnings. During January and February of this year the star loaders of the company had averaged \$10.22 per day; the best cutters, \$13.12.

James Elwood Jones, first vice-president, Pocahontas Fuel Co., was the last witness of the day. He filed a statement showing inside day rates ranging from \$4.96 to \$6 in April, 1920; a peak of \$6.48 to \$7.52 in September, 1920, and \$3.60 to \$4.80 in 1927. Outside day rates were \$4.40 to \$6.40, \$5.44 to \$7.44 and \$3.20 to \$5.20, respectively. Mining rates per standard car of 3.3 to 3.4 tons, were \$1.60 in April, 1920; \$2 in September, 1920, and \$1.30 in 1927. The low point in these rates was touched in February, 1922—\$1.20 per car. The statement showed seven changes in rates since April, 1920.

Ohio operators presented their version of the situation at the hearings this week. L. H. Bray, general manager, Cambridge Collieries Co., led off Monday morning. Speaking upon behalf of that organization and Akron, Forsythe, Morris, National and New Pocock Coal companies, he said these interests had mined 5,859,297 tons in 1924-1926 and lost \$2,509,768.18. All of the mines in the Cambridge district have been idle since April 1, 1927; some went down before that time because they were unable to compete with West Virginia and Kentucky coal.

W. E. Tytus, president, Sunday Creek Coal Co., declared that the policy of the union "has had a blighting effect on the Hocking district." He joined Mr. Bray in insisting upon a competitive scale and asserted that the entire labor controversy in the Hocking district "results from the unwillingness of the officials of the United Mine Workers to permit their men to resume work at a wage scale the operators can afford to pay."

GEORGE M. JONES, president, Ohio Collieries Co., who testified Tuesday, also maintained operation under the Jacksonville scale was impossible in the face of the non-union competition from the South. He offered competition and overproduction as the explanation of the sales of coal below the cost of production. When Senator Gooding suggested the committee was seeking ways to remedy this situation, Mr. Jones replied that "as a coal operator I hope you will be able to help us unload our troubles onto the public." Later he told Mr. Lewis that he did not think his judgment in selling below cost had been any worse than the labor leader's judgment in trying to maintain a high wage scale in the Central Competitive Field.

Ezra Van Horn, general manager, Clarkson Coal Mining Co., was the second witness of the day. He reviewed the conditions under which the Ohio mines had struggled during the life of the Jacksonville agreement. There had been no hints at violence until open-shop operations were attempted. Under open-shop operations, he testified, the ten top loaders averaged \$6.20 per day at Clarkson mines in January, 1928; \$6 in February and \$6.55 in March. Machine runners had averaged \$8.68 in February and \$8.20 last month. The average for all other workers was \$5.53 in January, \$5.50 in February and \$5.78 in March.

"Suppose," asked Mr. Lewis, "that the mine workers would agree to reduce wages all over the country to a \$5 level; would that mean any more operating time and that any more coal would be consumed in any substantial manner?"

"No sir; it would not."

"Would you be opposed to any federal legislation that might be evolved by Congress that would stabilize the industry to a degree where you might receive a fair return on your investment?"

"We are always interested in anything that will help us financially and give us a profit."

H. L. FINDLAY, vice-president, Youghiogheny & Ohio Coal Co., and Whitney Warner, W. L. Warner & Co., were the only witnesses heard today. A large part of the testimony of the former was taken up with a discussion of the lake cargo coal issue. Overproduction was the bane of the industry, said Mr. Findlay, who suggested the prohibition of open billing by law and the elimination of the "curbstone" brokers. Senator Gooding remarked that legislation was necessary to permit organization or the coal producer always would be at the mercy of the big consumer.

"You can't ask the public to support unnecessary mines," answered Mr. Findlay.

"Nobody expects that. There is reason for believing that coal could be made cheaper under some plan of intelligent distribution."

With a proper adjustment of lake cargo rates and wages, said Mr. Warner, Ohio would be able to hold its share of the market. Mr. Warner introduced the famous exchange of letters between the late Warren S. Stone and Mr. Lewis. The latter questioned Mr. Warner sharply on the financial involvements of the institutions affiliated with the Brotherhood of Locomotive Engineers and emphasized the fact that the Coal River Collieries Co. was in the hands of receivers.

It is expected that the Ohio operators will conclude their testimony tomorrow, when H. E. Willard, secretary, U. S. Coal Co.; W. L. Robison, vice-president, Youghiogheny & Ohio Coal Co., and R. L. Ireland, Jr., general manager of bituminous operations, M. A. Hanna Co., will be heard.

Next week the committee plans to hear Pennsylvania operating interests.

Announcement was made on April 23 of the appointment of a subcommittee to study the legal phases of the situation and to consider specific legislative proposals suggested by various interests. Senator Watson of Indiana, chairman of the committee, will act also as chairman of the subcommittee. The other members are: Senators Goff of West Virginia, Gooding of Idaho, Pittman of Nevada, Wagner of New York and Wheeler of Montana.

Uses New Shooting Method

The Nortonville Coal Mining Co., Nortonville, Ky., a division of the Monro-Warrior Interests, of Birmingham, Ala., is taking an active part in experimental work and development of new methods of using explosives. For some months past it has also been developing a new steel tube or shell that is used in shooting faces in underground mines.

These tubes or cartridges are the same diameter as the drillhole, and are made in three lengths, which controls the amount of powder that will be used in shotfiring. They do away with paper tubes and tamping. The shell is so arranged that an expanding connection at the face tightens it in the hole, and no tamping is necessary. It takes the force of the shot to the back of the hole, resulting in coal coming down cleaner and with far less slack. Either black powder or permissible explosive can be used.

The idea was developed by the Nortonville organization, and a patent has been applied for. The shells are recovered after each shot and used over and over.

Union Miners to Share Profits

By a vote of five to one miners of district 26, United Mine Workers—Glace Bay, Nova Scotia—have accepted a new contract offered by the British Empire Steel Corporation carrying an increase in wages. The agreement, which is for two years, is based on a profit-sharing plan. The company will divide among the lower paid men \$300,-

000 of the profits made during the year over and above the profits for 1927, and in addition will distribute 25 per cent of the earnings over and above the \$300,000 previously provided for among the entire body of miners. The new agreement, which was voted on April 19, becomes effective immediately. Union officials urged its acceptance.

Cuts Illinois-St. Louis Rate

A reduction in rates on Illinois coal moving to St. Louis was ordered April 24 by the Interstate Commerce Commission, effective June 28. From the Belleville mining district to St. Louis a rate of \$1.04 per ton instead of the existing rate of \$1.16 was prescribed, while from southern Illinois groups of mines to St. Louis a rate of \$1.30 was declared reasonable to replace the present rate of \$1.38½.

Receiver for Knox Company

Suit for a receiver for the Knox Consolidated Coal Co. was filed April 15 in Superior Court in Indianapolis, Ind., by Banus E. Neal of Indianapolis, a stockholder and bondholder. E. D. Logsdon, president of the company, was named receiver. At the offices of the company it was stated that the suit was a friendly action to conserve the assets of the company in a period of enforced suspension because of the depression in the coal industry. The company owns three large mines in Knox County, Indiana, together with 6,500 acres of coal lands and rights. The mines have been idle since April 1, 1927.

Coming Meetings

Chamber of Commerce of the United States. Sixteenth annual meeting May 7-11, at Washington, D. C.

American Mining Congress, manufacturers' division. Fifth annual convention and national exposition, May 7-11, Cincinnati, Ohio.

International Railway Fuel Association. Annual meeting, May 8-11, Hotel Sherman, Chicago, Ill.

Mine Inspectors' Institute of America. Spring meeting, May 14-16, Phoenix Hotel, Lexington, Ky.

Mine Inspectors' Institute of America. Annual meeting, May 14-16, Lexington, Ky.

Missouri Valley Retail Coal Merchants' Association. Annual convention, May 15-16, at Kansas City Athletic Club, Kansas City, Mo.

Oklahoma Retail Coal Merchants' Association, in conjunction with Oklahoma Grain Dealers' Association, May 18 and 19, at Enid, Okla.

National Coal Association. Eleventh annual meeting will be held Nov. 14-16 instead of May 23-25, at Cleveland Hotel, Cleveland, Ohio.

California Retail Fuel Dealers' Association. Annual convention, May 24-26, at Camp Curry, Yosemite Park, Calif.

Illinois Mining Institute. Summer meeting on the Steamer "Cape Girardeau," from Cairo, Ill., June 21-24.



Robert C. Hill

Reduction in Rates to Lakes On Southern Roads Stands

The order of the Interstate Commerce Commission prohibiting the Southern carriers from reducing rates on lake cargo coal 20c. per net ton was enjoined by the United States District Court for the Southern District of West Virginia in a decision handed down at Richmond, Va., April 14. Three days later the Supreme Court of the United States declined to stay the order of the lower court pending appeal. The petition for a stay was made by the Northern operators, but neither the Commission nor the Attorney General joined in that action. The lower rates went into effect on April 20.

Balked in the courts, the Northern operators now are endeavoring to have the carriers serving their mines reduce rates 20c. A number of meetings have been held. Executives of the trunk lines have assured the operators that the question will be given careful consideration, but no final decision had been announced up to the time this issue of *Coal Age* went to press.

In the order enjoining the Commission the court said that the federal rate tribunal had exceeded its powers and acted upon erroneous theories of law. "We think," said the court, "that its action was essentially an effort to equalize industrial conditions so as to offset economic advantages by rate adjustments not warranted by anything contained in the Transportation act of 1920 or in the Hoch-Smith resolution.

"We think that it erred, as a matter of law, in holding that the burden was upon carriers who had filed schedules reducing rates to show that the rates as reduced were not unreasonably low as compared with lower maximum rates prescribed for shipments from another field, and in holding that the schedules should be canceled for failure of the carriers to sustain this burden.

"We think that there was error of law also in the holding that the burden was

Name Hill and Anderson To Head Consolidation

CLARENCE W. WATSON, former U. S. Senator from West Virginia, retired from the presidency of the Consolidation Coal Co. on April 11 at the annual meeting of the company held in New York City. He is succeeded by George J. Anderson, executive vice-president since 1926. Robert C. Hill, vice-president of the Madeira-Hill Coal Co., was elected chairman of the board and chairman of the executive committee.

Mr. Hill has been connected with the Madeira-Hill company since its organization and has interests in both the hard- and soft-coal lines. He also is president of the Avonmore Coal & Coke Co., vice-president of the Broadtop R.R. and a member of the executive committee of the Tennessee Central R.R.

The following vice-presidents were re-elected: H. H. Snoderly, F. R. Lyon, F. W. Wilshire and E. M. Mancourt, and these directors were chosen: Raymond B. Fosdick, Robert C. Hill, F. W. Shibley, W. Bladen Lowndes, Harry P. Fish, Brooks Fleming, Jr.; F. W. Wilshire, C. W. Watson, Arthur Woods and Barton P. Turnbull.

The retiring president of the company, ex-Senator Watson, issued this statement:

"After 50 years' active service with the Consolidation Coal Co. or companies affiliated with it I am severing all official connection with it except as a director. This is done largely on the advice of my physician. Robert C. Hill, who has been made chairman of the board, has a wide and successful experience in coal. George J. Anderson, who has been made president, has been in the service of the company for several years and is entirely capable of taking this office. In these changes there is complete harmony between the majority stockholders and the interests I represent."

upon the carriers proposing a reduction of rates to justify the reduction under Section 15(A) (2) of the Transportation act of 1920, or the Hoch-Smith resolution."

Appoints Board of Standards

The Government of Alberta has decided upon the establishment of a Board of Standards, to supervise the shipment of coal from the mines of that province to Ontario, to insure that only coal of the best and most suitable qualities be sent. The Board will consist of R. J. Dinning, chairman; Edgar Stansfield, University of Alberta fuel expert; R. G. Drinnan, Edmonton, and Fuel Commissioner Ellis of Ontario. At a meeting of coal operators held in Edmonton the formation of a Board of Standards was approved of, and the question of organizing a pool for the co-operative selling of coal in the Ontario market was under consideration.



George J. Anderson

Renew Union Truce at Mines In Illinois and Indiana

The Old Ben Coal Corporation, Bell & Zoller Coal & Mining Co. and the Peabody Coal Co., three of the largest producers in Illinois, are among the companies operating under the terms of the truce agreement with the United Mine Workers. Others among 65 reported to have temporarily renewed the Jacksonville pact are the Franklin County Mining Co., J. K. Dering Coal Co., Eldorado, 600 men; Brown & Brake Coal Co., Harrisburg, 150 men; Saline Valley Coal Co., Carrier Mills, 150 men; Lone Star Coal Co., Carrier Mills, 100 men, and the Tanner Coal Co., southern Saline County, 100 men. In Indiana 131 companies have taken similar action.

Ohio Union Ousts Daugherty And Relief Committee

Oral Daugherty, president of Sub-district No. 1 of District No. 6, United Mine Workers, was removed from office and several hundred union members who recently had participated in "marches of protest" were ordered expelled from the union at a meeting of the Ohio organization held at the state headquarters in Columbus on April 23. Members of the so-called Pennsylvania-Ohio Relief Committee also were ordered expelled on the recommendation of the international executive committee.

Daugherty, as president of the sub-district comprising the Hocking Valley and Sunday Creek fields, was charged with making statements against policies of the organization which were declared by the state executive board to be "in-subordination, disloyalty and not in the best interests of the organization and its membership." By his dismissal Robert Bell, vice-president of the subdistrict, automatically becomes president.

The Pennsylvania-Ohio Relief Committee members were ousted because of

their radical and communistic tendencies, it was announced. It is estimated that between 200 and 300 union members are affected by the action of the board.

Change Heart on 1917 Scale

Members of the Coonville (Ohio) local of the United Mine Workers, who on April 16 voted to accept the 1917 wage scale and return to work at the mines of the Central West Coal & Lumber Co., rescinded that action at a meeting held April 21 which was attended by 200 miners from all sections of the southern Ohio field. Union officials informed the Coonville miners that they would forfeit their charter if they went to work under the 1917 scale.

Personal Notes

G. WEBB SHILLINGFORD, president of the Empire Coal Sales Corporation, 17 Battery Place, New York, and the Empire Coal Mining Co., Clearfield, Pa., recently became chairman of the board of directors and active head of the Merit Equipment Co., Cleveland, Ohio, a manufacturing concern. He will devote a large portion of his time to the company in Cleveland but will remain as active head of the coal companies. A. M. Stevens, formerly sales manager of the Empire Coal Sales Corporation, has been elected vice-president and general sales manager of that company, with headquarters in New York.

L. E. Woods, president of the Crystal Block companies, Welch, W. Va., has been unanimously elected president of the Operators' Association of the Williamson Field. He succeeds the late Thomas DeVeny. W. A. Richards, president of the Majestic Collieries Co., succeeds Mr. Woods as vice-president.

T. SASAKI who arrived in Japan March 16 from a trip to the United States, has been appointed general manager of the Bibai collieries of the Mitsubishi Mining Co., located at Sorachigun, Hokkaido, Japan.

ALLEN & GARCIA Co. have moved their offices from 21 West Van Buren St. to more spacious quarters in the McCormick Building, 332 So. Michigan Ave., Chicago.

Obituary

EDWARD N. ZERN, 49, well known in the coal-mining industry, died April 8 at his home in Crafton, Pa. He received his B.S. degree from Pennsylvania State College in 1903 and a mining engineering degree from the University of Pittsburgh. After a varied career as mining engineer with a number of coal companies and as a teacher he became editor, in 1917, of the Keystone Coal Buyers' Catalog, which post he held until his death. He also edited the 12th edition of the Coal Miners' Pocketbook.

10,022,195 Tons Loaded Mechanically In 1925; Indiana in the Lead

A total of 10,022,195 tons of bituminous coal was loaded mechanically by 455 machines in 131 mines in the United States in 1926, according to a report just released by the U. S. Bureau of Mines, embodying figures taken from a study by F. G. Tryon. In addition 33 other mines reported having 43 loading machines in experimental use. In the preceding year the quantity loaded by machine was 6,243,104 tons; in 1924, 3,495,522 tons, and in 1923, 1,879,726 tons. Hand loading conveyors and mine-car loaders as well as machines that have been abandoned are not included in the figures.

Indiana led all other states in tonnage mechanically loaded in 1926 with 2,166,737 tons, followed by Illinois, with 2,035,521 tons; West Virginia, 2,000,636 tons; Wyoming, 1,142,304 tons; and Virginia, 1,086,480 tons. Pennsylvania reported 855,578 tons, a large part of which was handled by "self-loading" conveyors. Eleven other states loaded by machine, but the quantity was relatively small.

Coal loaded mechanically in 1926 was

1.8 per cent of the total production of all bituminous mines in the country. In some states, however, a considerable part of the output was loaded by machine. Thus in Wyoming the proportion was 17.6 per cent of the state's production; Indiana, 9.3 per cent; Virginia, 7.7 per cent; Illinois, 2.9 per cent, and in Utah, 2.6 per cent.

Of the 131 mines that used mechanical loaders in 1926 there were 13 in which the process of mechanization had so far advanced that 90 per cent of the mine output was loaded mechanically. In 55 of the mines, on the other hand, the proportion loaded mechanically was still less than 10 per cent. For the entire group of 131 mines the proportion loaded mechanically was 24.9 per cent, the total output of these mines, including coal loaded in workings still operated by hand being 4,329,133 tons. In certain states the proportion was much higher; the 7 machine-loading mines of Wyoming loaded 63.6 per cent of their production mechanically, and the 13 mines of Indiana loaded 89.4 per cent in that manner.

Mechanical Loading Underground in Bituminous Coal Mines in 1926

State	No. Mines	No. Loading Machines	Net Tons Loaded by Machine	Loading by Machine in 1926			Per Cent of State Output Loaded by Machines	Other Mines Reporting Loading Machines But Not Tonnage*
				Hand Loading	Machine	Total Production of These Mines		
Alabama	3	30	111,803	458,455	24.4	0.5	1	†
Colorado	3	†	†	†	†	2,900,665	2.9	2
Illinois	18	107	2,035,521	8,050,665	25.3	1,142,304	9.3	1
Indiana	13	87	2,166,737	2,423,681	89.4	1,086,480	1.8	†
Iowa	6	8	84,325	949,732	8.9	†	1	†
Kentucky	10	20	181,763	4,286,921	4.2	0.3	5	5
Maryland	1	†	†	†	†	†	†	†
Michigan	2	†	†	†	†	†	†	†
New Mexico	1	†	†	†	†	†	†	†
North Dakota	1	†	†	†	†	†	†	†
Ohio	3	10	122,576	1,303,590	9.4	0.4	2	†
Pennsylvania	20	48	855,578	5,512,447	15.5	0.6	4	5
Tennessee	2	†	†	†	†	†	2	†
Utah	6	8	114,619	1,214,530	9.4	2.6	1	†
Virginia	6	17	1,086,480	3,391,417	32.0	7.7	2	†
West Virginia	29	57	2,000,636	9,354,888	21.4	1.4	12	18
Wyoming	7	44	1,142,304	1,796,396	63.6	17.6	†	†
Undistributed	...	19	119,853	1,584,411	7.6	0.5	15	15
Total	131	455	10,022,195	40,329,133	24.9	1.8	33	43
Recapitulation:								
Scraper loaders	50	133	1,554,372	40,329,133	24.9	0.3	13	16
Shaking-shovel and "self-loading" conveyors†	10	27	681,463	40,329,133	24.9	0.1	20	27
Other loaders§	71	295	7,786,360	40,329,133	24.9	1.4	20	27
Total	131	455	10,022,195	40,329,133	24.9	1.8	33	43

The table covers all devices by which most of coal handled is loaded without hand shoveling. It does not cover mine-car loaders and conveyors on which all the coal has to be shoveled by hand, although it should be remembered that such devices, by reducing the height to which the miner must lift the coal, greatly reduce the labor of hand shoveling.

*In practically all of these, the use of loading machines was in the experimental stage only. †Included in "Undistributed" to avoid disclosing individual operations. ‡Includes shaking-trough conveyors equipped with shovel attachment on front end (so-called "duckbills") on which reports indicated 60 to 90 per cent loaded without hand shoveling, and also two makes of long-face conveyors designed to receive coal as shot down, on which a large part of the coal (sometimes more than half) is loaded without hand shoveling. These types can not be shown separately without disclosing individual operations. §Includes mobile digging and loading machines and cutting and loading machines.

JOHN M. WRIGHT, 58, president of the Raleigh Coal & Coke Co., died at Cincinnati, Ohio, April 17, the funeral taking place on April 20. Mr. Wright entered the coal business in Cincinnati in 1912, later organizing the Raleigh Coal & Coke Co. to develop coal property near Raleigh, W. Va. He was a director of a number of other Cincinnati business enterprises.

ROBERT NESTER, 45 years old, coal mine operator at Boonville, Ind., died in a hospital in Evansville on April 19. Death was due to heart trouble, following an attack of influenza. Mr. Nester was the son of the late George P. Nester, who for many years was owner of the Otter Creek coal mine at Boonville. He had operated the mine since the death of his father.

Washington Letter

BY PAUL WOOTON
Special Correspondent

MUCH interest is being shown in the detailed statistics of coal mechanically loaded in 1926, which recently were prepared by F. G. Tryon, of the Bureau of Mines staff. The report is printed elsewhere in this issue. The Bureau has in preparation a more detailed report giving many additional points of interest.

It is recognized that rapid progress has been made in the number of machines installed since 1926, but the Bureau's analysis is the only complete and accurate picture of the condition prevailing over the country as a whole. In many of the mines which loaded coal mechanically the use of machines hardly had passed the experimental stage by the end of 1926. The record therefore is a composite of the performance of some of the mines that were completely mechanized and some others in which mechanization was barely under way.

There were fourteen mines in 1926 in which 90 per cent or more of the total output was mechanically loaded and these mines, although only 10 per cent of the total, loaded 26 per cent of the machine-loaded tonnage. In this group mechanization is practically complete.

At the other end of the scale there were 55 mines in which the mechanical loading accounted for less than 10 per cent of the mines' production. In these mines, although mechanical loading was stated to be in the commercial stage, it had thus far displaced but little hand loading. It was, therefore, natural that these mines loaded only 6 per cent of the total machine-loaded tonnage.

THE percentage of the total output of the mines which have installed mechanical loaders that was actually loaded by machine thus is an index to the degree to which the operators concerned have carried the process of mechanization. Naturally in most districts the percentage is still low, but in others it has risen surprisingly high. Thus the seven mines in Wyoming which have installed mechanical loaders reported that they loaded 63.6 per cent of their tonnage by machines and the 13 mines in Indiana reported 89.4 per cent of their tonnage loaded by machine.

As a group the machine-loading mines worked more steadily than the hand-loading mines in 1926. The average working time for the 131 machine-loading mines was 246 days, as against only 216 days for all other deep mines. In some of the states where machine loading has progressed farthest the steadier working of the mechanized mines is shown by the following table:

State	Machine-loading mines	Other deep mines
Illinois	225	168
Indiana	226	167
Virginia	292	256
West Virginia	265	246
Wyoming	193	178
United States Total	246	216

Growing Interest Shown In Foreman Training

Foreman training courses show a great increase in practically all lines of industry throughout the country according to a survey report issued by the department of manufacture of the Chamber of Commerce of the United States. The number of such courses jumped from 105 in 1925 to 933 in 1927. The greatest increases last year took place in Connecticut, Michigan and West Virginia. The first-named state rose from 3 to 46; the second from 5 to 73, and the last from 4 to 43.

The great increase in these courses within the short period from 1925 to 1927, the bulletin says, "bears eloquent testimony to the fact that today industry regards the trained foreman as a most important factor in management. The greater use of intricate and expensive machinery requires not only better trained attendants but better selected and equipped foremen to lead the personnel for more effective production."

There doubtless is more than one cause for the favorable showing of the mechanized mines. It is probable that the companies most active in experimentation with machines are the very ones most strongly financed and the more able to compete in other respects. Nevertheless, the fact that they were able to operate so much more steadily than the hand-loading mines suggests that they have found mechanical loading advantageous.

THE introduction of loading machines also has increased the output per man per shift, although on this point the statistical record is incomplete. It can be said, however, that the output per man per year was materially higher in the machine-loading mines than in the hand-loading mines, as is shown by the following:

State	Tons per man per Year	
	Machine-loading mines	Other deep mines
Illinois	1,260	852
Indiana	1,431	852
Virginia	1,316	960
West Virginia	1,300	1,202
Wyoming	1,384	976
United States		
Total	1,215	963

This superior showing per worker per year in the machine mines appears to be due chiefly to the steadier operation, but the higher output per man-shift is a factor as well. It shows, among other things, the much greater opportunity to earn which is enjoyed by workers in the mechanized mines.

Another striking feature in the compilation is the large proportion of the total mechanically loaded — 10,022,000 tons—which comes from the Northern states. Indiana and Illinois lead all other states in the tonnage mechanically loaded. Wyoming leads even Indiana in the percentage of the output loaded

by machine. These three states contribute 5,345,000 tons, or more than all the remaining fourteen states in which mechanical loading has been introduced. Their only serious rivals were the two Virginias, which together loaded 3,086,000 tons by machines. Most of this tonnage comes from the Pocahontas district, including its extension into Tazewell County, West Virginia.

Higher wage rates in the Northern fields doubtless have had an important bearing on this development. Comparison with 1925 is difficult because the Bureau's records for the two years are not exactly comparable on account of differences in classification. It is clear, however, that the increase over 1925, which amounts to about 60 per cent, came chiefly from the Northern fields.

The machine tonnage of Wyoming practically doubled. That of Illinois also nearly doubled, while that of Indiana shows a very large increase. A material increase is shown in Pennsylvania, although the tonnage loaded mechanically in that state is as yet comparatively small. There was an increase in the two Virginias, taken together, but a much smaller one.

THESE figures do not include the use of hand-shoveled face conveyors, in which there has been a significant development. For the year 1927 the Bureau will publish a detailed analysis of the use of conveyors, showing the number of units installed, the total linear footage and the quantity handled by conveyors. It is appreciated that although such conveyors do not eliminate the use of the shovel entirely, they greatly reduce the labor by reducing the height to which the miner has to lift the coal. It is, therefore, held to be reasonable to include conveyors in a complete survey of the extent of "mechanization."

The incomplete figures at hand on conveyors indicate that the tonnage so handled exceeds 1,000,000. This, added to the 10,022,000 tons mechanically loaded, indicates a total of 11,000,000 tons of bituminous coal produced by mechanical mining in 1926. This is regarded as the most encouraging progress for a development which practically dates only from 1923.

Roads Consume Less Coal; Price Declines

Coal consumed for locomotive fuel by class 1 railroads of the United States, in road train service during February totaled 7,871,657 net tons; in yard switching service, 1,619,265 tons. In the corresponding month of 1927 the figures were 8,079,332 and 1,729,221 tons.

The average cost of this coal, including freight, in February, 1928, was: Eastern district, \$2.59; Southern, \$2.14; Western, \$2.85; United States, \$2.56. Compared with February, 1927, these figures represent reductions of 22c. in the Eastern district, 7c. in the Southern district, 5c. in the Western district and 14c. for the country.

Current Prices of Mining Supplies

SINCE LAST MONTH

STEADINESS prevails in prices of mining supplies with the exception of slight advances in copper products. Bare copper wire is up $\frac{1}{2}$ to $\frac{1}{4}$ c. per lb. at principal distributing centers, while scrap brass and copper are higher in the East. Pig-iron buying continues in small lots with prices unchanged. Finished steel, however, is reported as subject to a small amount of cutting under with the official quotation remaining at \$1.90 per 100 lb., Pittsburgh, in carload or larger lots.

STEEL RAILS

	Pittsburgh	Birmingham	Chicago
Standard Bessemer rails	\$43.00	\$43.00	\$43.00
Standard open-hearth rails	43.00	43.00	43.00
Light rails, 25 to 45 lb.	36.00	34@36	36@38

TRACK SUPPLIES

	Pittsburgh	Chicago	Birmingham
Standard spikes, $\frac{1}{2}$ -in. and larger	\$2.75@\$2.80	\$3.55	\$3.00
Track bolts	3.80	4.55	3.90
Standard section angle bars, splice bars or fishplates	2.75	3.40	...

WROUGHT STEEL PIPE

	Black		
	New York	Chicago	St. Louis
1 to 3 in. butt welded	53%	54%	49%
2 to 6 in. lap welded	48%	51%	46%
	Galvanized		
	New York	Chicago	St. Louis
1 to 3 in. butt welded	39%	41%	36%
2 to 6 in. lap welded	35%	38%	33%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches		Thickness Inches
		External	Internal	
1	\$0.17	1.315	1.049	.133
1 $\frac{1}{2}$	.23	1.66	1.38	.14
1 $\frac{3}{4}$	.27 $\frac{1}{4}$	1.9	1.61	.145
2	.37	2.375	2.067	.154
2 $\frac{1}{2}$	.58 $\frac{1}{4}$	2.875	2.469	.203
3	.76 $\frac{1}{4}$	3.5	3.068	.216
3 $\frac{1}{2}$	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4 $\frac{1}{2}$	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

CAST-IRON PIPE

	Birmingham	Burlington, N. J.	New York
4 in.	\$31.00	\$38.00	\$40.60
6 in. and over	28.00	35.00	37.60
Pittsburgh	Chicago	St. Louis	San Francisco
4 in.	\$39.50	\$39.20	\$36.60
6 in. and over	36.50	36.20	33.60
Gas pipe and Class "A,"	\$3.00 per ton extra.		

BOLTS AND NUTS

Discounts from list, Apr. 1, 1927, on immediate deliveries from warehouse in New York and vicinity: Machine bolts, square heads and nuts, up to 1x30-in., full packages, 50%; Carriage bolts up to $\frac{1}{2}$ x 6-in., full packages, 55%; Nuts, hot-pressed or cold-punched, blank or tapped, square or hexagonal, full packages, 55%.

STEEL PLATES

Following are base prices per 100 lb. in carloads, f.o.b., for $\frac{1}{2}$ -in. thick and heavier:

Pittsburgh	Birmingham	\$2.00

STRUCTURAL RIVETS

The following quotations are per 100 lb., in carloads, f.o.b. mill, for $\frac{1}{2}$ -in.:

Pittsburgh	Cleveland	Chicago
\$2.90	\$2.90	\$3.00

WIRE ROPE

Discounts from list price on regular grades of bright and galvanized, in New York and territory east of Missouri River:

	Per Cent
Plow steel round strand rope	35
Special steel round strand rope	30
Cast steel round strand rope	20
Round strand iron and iron tiller	5
Galvanized steel rigging and guy rope	7 $\frac{1}{2}$
Galvanized iron rigging and guy rope (add to list)	12 $\frac{1}{2}$

RAIL BONDS

Stranded copper, 28-in., 4/0, B. & S. gage, are welded, at points east of the Mississippi, price per 100 net, \$90.36.

DRILL ROD

Discounts from list at warehouse:

New York	Cleveland	Chicago
60%	55%	50%

FRICITION TAPE

Size $\frac{1}{2}$ -in. in 100 lb. lots in Eastern territory, per lb., \$0.29

RAILWAY TIES

For fair-sized orders, the following prices per tie hold:

	6 In. x 8 In.	7 In. x 9 In.
by 8 Ft.	by 8 $\frac{1}{2}$ Ft.	
Chicago white oak, heart, untreated	\$1.40	\$1.78
Chicago, oak, empty cell creosoted	1.80	2.40
Chicago, oak, zinc treated	1.60	2.10
St. Louis, sap pine or cypress, untreated	.95@1.05	1.30@1.40
St. Louis, pine or cypress, creosoted	1.75	2.10
Birmingham, white oak, heart, untreated	1.25	1.45
Birmingham, white oak, creosoted	1.70	1.90

STEEL MINE TIES

Prices range from \$0.38 to \$0.60 per tie, f.o.b. Pennsylvania and West Virginia districts, depending on quantity, gage of track and weight of rail.

CALCIUM CARBIDE

In drums, round lots in New York market, per lb., \$0.05@\$0.06.

BRATTICE CLOTH

Prices f.o.b. cars New York, Philadelphia, St. Louis or Chicago, per sq.yd.:

Jute, 24-oz., double warp	\$0.20	Jute, waterproof	\$0.28
Jute, 22-oz., single warp	.17 $\frac{1}{2}$	Duck, waterproof	.35
Jute, 18-oz., single warp	.15	Duck, non-inflammable	.33
Old sail cloth	.62		

COTTON WASTE

The following prices are in cents per lb. for bale lots:

	New York	Cleveland	Chicago
White	10.00@13.50	16.00	15.00
Colored	9.00@13.00	12.00	12.00

MACHINE OIL

Medium bodied, in 55 gal. metal barrels, per gal., as follows:

New York	Cleveland	Chicago
\$0.30	\$0.36	\$0.36

SCRAP IRON AND STEEL

The prices following are f.o.b. per ton paid by dealers:

	New York	Chicago	Birmingham
Per Gross Ton	Per Net Ton	Per Gross Ton	
No. 1 railroad wrought	\$10.00@\$10.50	\$11.25@\$11.75	\$11.00@\$11.50
Stove plate	8.50@ 9.00	12.00@ 12.50	9.00@ 9.50
No. 1 machinery cast	12.50@ 14.00	13.75@ 14.25	12.50@ 14.00
Machine shop turnings	6.75@ 7.50	7.00@ 7.50	7.00@ 7.25
Cast borings	6.75@ 7.50	9.50@ 10.00	7.25@ 7.50
Railroad malleable	10.00	12.50@ 13.00	10.25@ 10.75
Re-rolling rails	10.50@ 11.00	13.50@ 14.00	10.25@ 10.75
Re-laying rails	23.00@ 24.00	23.00@ 24.00	
Heavy melting steel	7.00@ 10.75	12.50@ 13.00	

SCRAP COPPER AND BRASS

Dealers' purchasing prices in cents per lb. are as follows:

New York	Cleveland	Chicago (mill)
19.50	19.62	16.12

TROLLEY WIRE

In carload lots, f.o.b., producing point, all sizes, per lb.:

Round
12.37 $\frac{1}{2}$ @ 12.62
11.50@ 12.37 $\frac{1}{2}$
10.25@ 10.75
7.25@ 7.50
9.25@ 9.75
5.50@ 6.00
7.50@ 8.00

TROLLEY WHEELS

Price f.o.b. Jersey City, N. J., each:

4-in.	\$1.00	6-in.	\$1.40

MINING MACHINE CABLE

F.o.b. producing point, net, per M. ft.:

No. 2 Duplex Flat, Braided	Two Conductor Round Rubber Sheathed
\$165.00	\$607.00
147.00	512.00
129.60	427.00

LOCOMOTIVE CABLE

F.o.b. producing point, single conductor braided, net, per M. ft.:

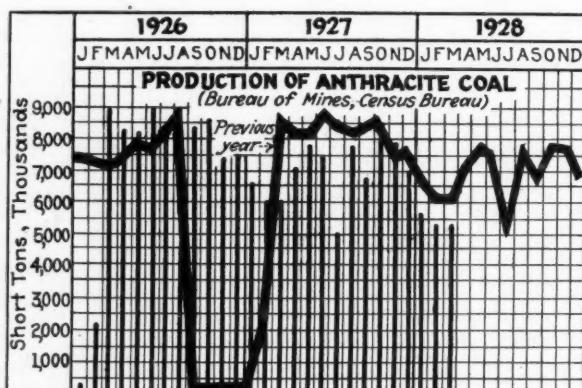
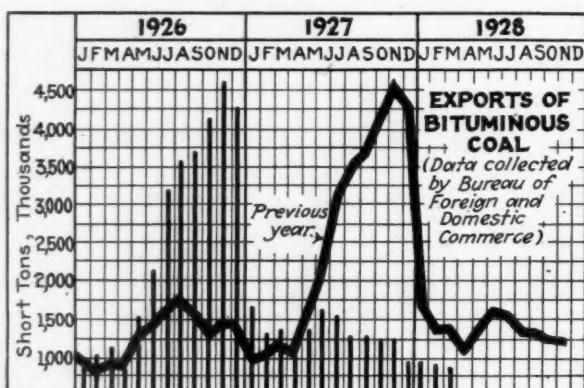
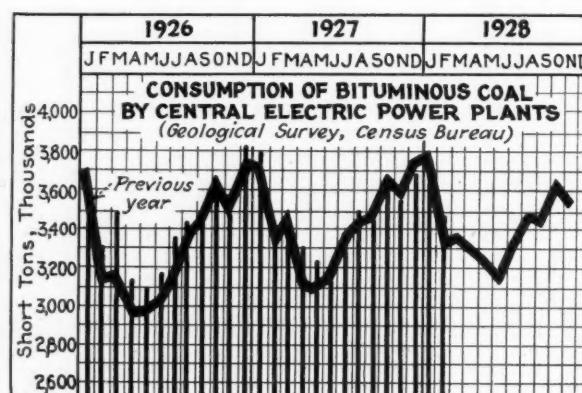
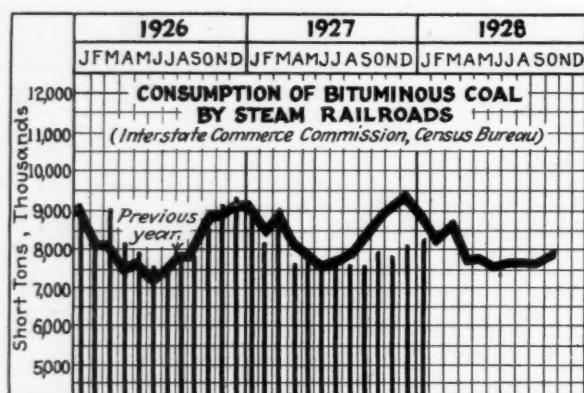
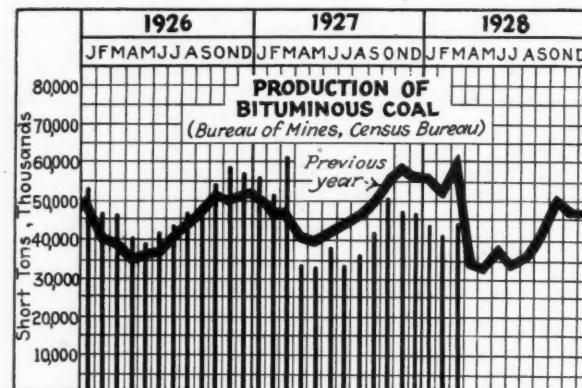
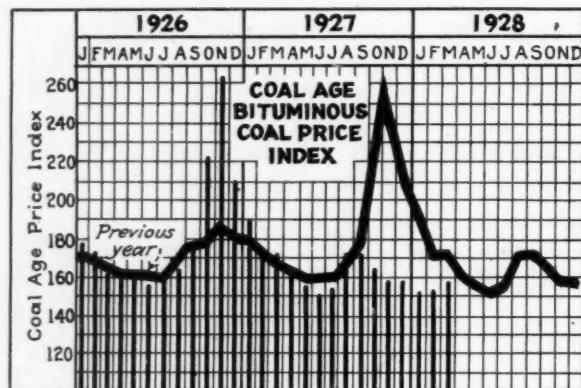
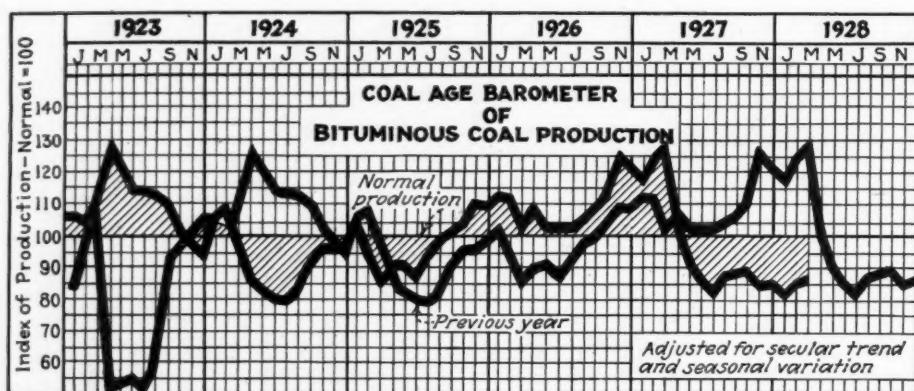
Size 3	\$85.00	Size 4	\$63.00

FEEDER CABLE

Price per M. ft. in larger buying centers east of the Mississippi River:

B. & S. Size	Two Conductor	Three Con
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Indicators of Activities in the Coal Industry



MARKETS

in Review

MARKET conditions in the bituminous coal trade during April were disappointingly dull. The expiration of the truce agreement with the United Mine Workers in Illinois, Indiana and the Southwest left the large industrial consumers apathetic. They had learned a year ago that the productive capacity of the non-union fields would tide them over a crisis. They still have stocks on hand and it seems to be well established that there are mines in Illinois and Indiana ready to go back into production whenever demand warrants.

Production has taken a sharp drop. During the first three weeks of April total bituminous output was 22,375,000 net tons. It is doubtful if the total for the month will go much over 30,000,000 tons. Weekly figures have run consistently under the totals for the corresponding weeks in 1927, when the strike tie-up was more general and stocks in the hands of the consumers much larger. As of April 1 the National Association of Purchasing Agents estimated stocks as 45,744,000 tons; on April 1, 1927 the reserve was 75,000,000 tons.

Coal Age Index of spot bituminous prices also shows a sharp decline. The figure for April 7 and April 14 was 156 and for April 21 and April 28 it was 155. The corresponding weighted averages were \$1.76 on the first two dates mentioned and \$1.75 for the last two. The figures subsequent to April 7 are tentative only and are subject to revision when later production data are available. The marked decrease in the higher-priced tonnage from Illinois and Indiana was largely responsible for the decline.

Demand in the Chicago market is at a low ebb. In the opinion of

many traders the Midwest coal situation has not been worse in years. Buyers are in a position to dictate on domestic sizes of bituminous and steam coals are weak despite the sharp drop in production that came with the expiration of the truce agreement with the union at the end of March.

IN PART, of course, the failure of Illinois and Indiana steam sizes to show any strength may be traced to the fact that a number of operators in both states are continuing production on the Jacksonville scale and other companies make no secret of their willingness to reopen if any business is in sight. A recent check shows 65 companies in Illinois and 131 in Indiana ready to operate. Only a small percentage of this number, however, actually are mining coal at the present time.

The smokeless coals of West Virginia are the only ones that give any sign of activity on the Chicago market. Eastern high-volatile offerings are a drug. In the steam trade the competition between western Kentucky and Illinois and Indiana persists as keenly as if all of the big mines north of the Ohio River were running full tilt.

A SLIGHT improvement is reported from Louisville. Part of the more optimistic tone is the result of the recent decision of the United States District Court in the lake cargo rates. Inquiries for lake tonnage from eastern Kentucky already have increased since the court decreed the 20c. reduction from the South should be permitted to become effective. Some buyers who had announced that they would take

only prepared coal now are in the market for slack as well.

The western section of the state, however, is less cheerful over the outlook. Increased freight differentials on coal moving north of the river constitute one problem which is worrying shippers. The fact that a number of Illinois and Indiana mines did not go down on April 1 and others are ready to go back into production at the first sign of business takes the edge off possibilities for record output.

There is, it is true, a keen demand for fine coal. This, however, is due more to the slowing up in the movement of the prepared sizes than to any expansion in industrial consumption. There are indications that many public utilities and industries burning the smaller sizes may be compelled to crush mine-run the next few weeks. Prices on screenings are firm and in some cases this coal now commands more in the open market than straight mine-run.

Increased industrial demand in the Northwest appears to have taken up the slack caused by the seasonal falling off in domestic requirements at the Head of the Lakes. Sales officials at the docks have made a special drive to clean up hang-over deliveries on outstanding contracts so that stocks may be cut to the minimum before the tax assessor starts his deadly work.

STOCKS on the docks at the opening of navigation probably will not exceed 2,000,000 tons of bituminous coal. Estimates of 1928-29 business are based on the assumption that the new shipping season will see as much coal loaded for the Northwest as the season

Current Quotations—Spot Prices, Anthracite—Gross Tons, F.O.B. Mines

Market Quoted	April 7, 1928		April 14, 1928		Week Ended		April 21, 1928		April 28, 1928	
	Independent	Company	Independent	Company	Independent	Company	Independent	Company	Independent	Company
Broken.....										
Broken.....										
Egg.....										
Egg.....										
Stove.....										
Stove.....										
Pea.....										
Pea.....										
Pea.....										
Pea.....										
Buck.....										
Buck.....										
Rice.....										
Rice.....										
Barley.....										
Barley.....										
Birdseye.....										

* Net tons, f.o.b. mines. † Domestic buckwheat \$3.25 (P. & R.) and \$3.50 (D. L. & W.)

ended last winter. With improved economic conditions the more sanguine even look for some industrial expansion with a correspondingly increased call for coal. March shipments from the docks were 18,518 cars, as compared with 22,804 cars the preceding month and 14,646 cars in March, 1927.

Dock interests do not believe that the new season prices on bituminous will show any substantial changes from those which ruled at the opening of navigation a year ago. Current quotations are firmly maintained. Reductions of 75c. to \$1.25 in anthracite prices as of April 1 have had a heartening effect upon sales of hard coal over the Northwest. Current quotations are \$12.45 for egg and nut, \$12.75 for stove, \$9.25 for pea and \$7.50 for buckwheat.

In the Southwest the trade was more interested in the announcement of spring storage prices than in the expiration of the truce agreement with union labor in the Kansas field. Most of the deep-shaft mines in that state are closed down because there is practically no demand for shaft coal. Strip pits operating under the Jacksonville scale, however, are fairly busy. Arkansas and Oklahoma are unaffected by the strike and part of Missouri pursues its non-union way.

SPRING prices approximate last year's levels. Bernice grate is quoted at \$6; egg, \$6.25; No. 4, \$8. Paris lump is \$4.75 and semi-anthracite from Arkansas, \$3.50@\$4.25. McAlester lump is \$5 and Henryetta coal \$3.50.

Current Quotations—Spot Prices, Bituminous Coal, Net Tons, F.O.B. Mines

LOW-VOLATILE, EASTERN

Market	Quoted	April 7, 1928	April 14, 1928	Week	Ended
Smokeless lump	Columbus	\$2.75@\$3.00	\$2.75@\$3.00	\$2.75@\$3.00	\$2.75@\$3.00
Smokeless mine-run	Columbus	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Smokeless screenings	Columbus	1.00@ 1.25	1.00@ 1.25	1.00@ 1.20	1.00@ 1.20
Smokeless lump	Chicago	2.75@ 3.25	2.25@ 3.00	2.50@ 3.00	2.50@ 3.00
Smokeless mine-run	Chicago	1.75@ 2.00	1.50@ 2.00	1.65@ 2.00	1.65@ 2.00
Smokeless lump	Cincinnati	2.50@ 3.00	2.50@ 3.00	2.25@ 3.00	2.50@ 3.00
Smokeless mine-run	Cincinnati	1.75@ 2.00	1.75@ 2.00	1.65@ 2.00	1.75@ 2.00
Smokeless screenings	Cincinnati	1.00@ 1.25	1.00@ 1.25	1.10@ 1.25	1.00@ 1.25
Smokeless mine-run*	Boston	3.90@ 4.10	3.90@ 4.15	3.90@ 4.15	3.90@ 4.15
Clearfield mine-run	Boston	1.50@ 1.85	1.50@ 1.80	1.50@ 1.80	1.50@ 1.80
Cambria mine-run	Boston	2.00@ 2.25	2.00@ 2.25	1.90@ 2.20	1.90@ 2.20
Somerset mine-run	Boston	1.65@ 2.05	1.70@ 2.10	1.65@ 2.00	1.65@ 2.00
Pool 1 (Navy Standard)	New York	2.40@ 2.60	2.35@ 2.60	2.35@ 2.60	2.35@ 2.60
Pool 1 (Navy Standard)	Philadelphia	2.45@ 2.70	2.35@ 2.60	2.30@ 2.60	2.30@ 2.60
Pool 1 (Navy Standard)	Baltimore	2.25@ 2.35	2.25@ 2.35	2.25@ 2.35	2.25@ 2.35
Pool 9 (super. low. vol.)	New York	1.95@ 2.05	1.85@ 2.05	1.85@ 2.05	1.85@ 2.05
Pool 9 (super. low. vol.)	Philadelphia	1.95@ 2.25	1.95@ 2.20	1.80@ 2.15	1.80@ 2.15
Pool 9 (super. low. vol.)	Baltimore	1.80@ 1.95	1.80@ 1.95	1.80@ 1.95	1.80@ 1.95
Pool 10 (h. gr. low. vol.)	New York	1.60@ 1.90	1.60@ 1.90	1.60@ 1.90	1.60@ 1.90
Pool 10 (h. gr. low. vol.)	Philadelphia	1.65@ 1.85	1.65@ 1.85	1.60@ 1.80	1.60@ 1.80
Pool 10 (h. gr. low. vol.)	Baltimore	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60
Pool 11 (low. vol.)	New York	1.40@ 1.65	1.40@ 1.65	1.40@ 1.65	1.40@ 1.65
Pool 11 (low. vol.)	Philadelphia	1.60@ 1.75	1.50@ 1.70	1.45@ 1.65	1.40@ 1.65
Pool 11 (low. vol.)	Baltimore	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50

HIGH-VOLATILE, EASTERN

Pool 54-64 (gas and st.)	New York	\$1.15@\$1.40	\$1.25@\$1.40	\$1.25@\$1.40	\$1.25@\$1.40
Pool 54-64 (gas and st.)	Philadelphia	1.25@ 1.60	1.25@ 1.55	1.25@ 1.50	1.25@ 1.45
Pool 54-64 (gas and st.)	Baltimore	1.35@ 1.40	1.35@ 1.40	1.35@ 1.40	1.35@ 1.40
Pittsburgh sc'd gas	Pittsburgh	2.00@ 2.10	2.00@ 2.15	2.00@ 2.15	2.00@ 2.10
Pittsburgh gas mine-run	Pittsburgh	1.75@ 1.90	1.75@ 1.90	1.75@ 1.85	1.75@ 1.85
Pittsburgh st. mine-run	Pittsburgh	1.40@ 1.80	1.40@ 1.80	1.40@ 1.80	1.40@ 1.80
Pittsburgh gas slack	Pittsburgh	1.05@ 1.15	1.10@ 1.20	1.15@ 1.25	1.15@ 1.25
Kanawha lump	Columbus	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25
Kanawha mine-run	Columbus	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60
Kanawha screenings	Columbus	.90@ 1.00	.95@ 1.25	1.00@ 1.25	1.00@ 1.25
W. Va. lump	Cincinnati	1.75@ 2.50	1.75@ 2.50	1.75@ 2.50	1.75@ 2.50
W. Va. gas mine-run	Cincinnati	1.50@ 1.65	1.40@ 1.65	1.40@ 1.65	1.50@ 1.65
W. Va. steam mine-run	Cincinnati	1.25@ 1.40	1.35@ 1.50	1.25@ 1.40	1.30@ 1.50
W. Va. screenings	Cincinnati	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25
Hocking lump	Columbus	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25
Hocking mine-run	Columbus	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Hocking screenings	Columbus	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25
Pitts. No. 8 lump	Cleveland	1.75@ 2.00	1.75@ 2.00	1.75@ 1.90	1.75@ 1.90
Pitts. No. 8 mine-run	Cleveland	1.25@ 1.70	1.25@ 1.70	1.40@ 1.60	1.40@ 1.60
Pitts. No. 8 screenings	Cleveland	1.10@ 1.25	1.00@ 1.30	1.00@ 1.20	1.00@ 1.20

* Gross tons, f.o.b. vessel, Hampton Roads.

Northern Missouri coal is offered at \$3@\$3.25; Hume-Worland, \$2.50. Kansas prices went off 25 to 50c. at the beginning of last month.

Colorado demand during April was lighter than during the same period in 1927. Weather conditions have been an adverse influence upon spring buying and mines are not doing better than 50 per cent. Current quotations show Walsenburg and Canon City lump at \$4.50; washed nut, \$4.25; washed chestnut, \$3.25; Trinidad lump, \$3.50; nut, \$3.25, and chestnut, \$3. Crested Butte anthracite ranges from \$6.75 to \$8.50, depending upon size. Northern Colorado lignite is offered from \$3.75 down. Southern Colorado steam sizes bring \$1.10@\$1.35. Rock Springs-Kemmerer lump is \$4; nut, \$3.75; steam sizes, \$1.25@\$1.35.

The court ban against enforcement of the order of the Interstate Commerce Commission prohibiting a reduction in lake cargo rates from the South changed the sentimental complexion of the Cincinnati market, turning pessimism into optimism. Until that decision was announced the market was experiencing one of the worst Aprils in its history. Movement of coal through the Cincinnati gateway had dropped from 10,402 cars the first week—in itself a decrease of over 4,000 cars when compared with 1927—to 8,770 cars the third week.

Prices on high-volatile lump and egg have been uneven with the tendency to weaken quite marked in both Kentucky and West Virginia offerings. Mine-run has gained slightly and slack coal has moved upward as quotations on

prepared sizes wobbled. Nothing was sold under \$1 and in many cases \$1.25 ruled. This was particularly true in the case of coals suitable for specialty uses.

Smokeless has been going through the throes of a price-cutting contest with sales of lump and egg down to \$2.50 as against a circular price of \$3. Nut and stove, however, have held fairly close to a \$2.25@\$2.75 range. The mine-run market has been erratic. Although the circular price was fixed at \$2 there were many sales at 25c. under that figure. Spot slack has commanded \$1@\$1.25 and contracts for the new year have been signed at \$1.25@\$1.50.

Slack was the only size which showed any life in the Columbus market the past month. Starting with a sudden upturn a few weeks ago, quotations soon steadied around \$1@\$1.25. At the same time the prices on prepared sizes went off, with smokeless coals falling from \$3.50 to \$2.75@\$3. Steam trade is quiet. Little attention has been paid to contract renewals as most industries feel confident that the supply offered on the spot market will take care of requirements. Some business has been renewed on a lower basis.

RAILROADS continue to draw heavily upon reserve stocks, according to reports current in the Columbus market. Railroad fuel agents show no desire to tie up with shippers on an annual basis. Public utilities also are using up surplus stocks. Despite the lack of support coming from these two large buying units there has been little distress tonnage on the Columbus market. Most shippers appear to have learned their lesson and are avoiding consignment shipments. Some Indiana coal is moving to central Ohio for railroad fuel.

With the rate situation again back to where it was when the Pittsburgh interests started their fight upon the lake adjustment, pessimism is again rampant in western Pennsylvania. Pressure now is being brought to bear upon the Northern roads to induce them to make a cut which will restore the differential relationship contemplated by the Commission's order. With lake business held up as a result of the rate situation, the district has been hard put to find a place to drop its tonnage. Prices on mine-run and screened sizes are weaker, but slack is firm.

The steam-coal market in New England dragged along through April without significant change. Contract business for the most part is discounted because so many purchasers continue to take their supplies through old channels, leaving little "shopping" business to attract the trade. As a result current prices serve more as an index than a measure of the average return to the operators shipping coal to the New England market.

The situation at Hampton Roads has been uniformly depressed. Movement to New England is somewhat less than a month ago and shippers also feel the effect of the slowing up in the

demand for prepared sizes. This, of course, has reduced the volume of slack seeking a market, but there has been no real improvement in the price situation in slack coal. Navy Standard slack is \$3@\$3.50 with mine-run wavering between \$3.90 and \$4.15.

On cars at Boston the market for inland deliveries has been fairly stable at \$5.10@\$5.25 with prices at Providence 10c. less. Nut-and-slack and straight slack are moving on the March bases. All-rail Pennsylvania coals are quiet; prices are as low as shippers care to go but there is little business to be had in the tidewater zone and inland in the all-rail belt demand is not exciting. Welsh and Scotch anthracite and German and Dutch ovoids are still factors in the domestic market.

Spot buying was slow in the New York market last month. Prices failed to show much change and the prospects for advances are not bright. Consumers appear to prefer using reserve stocks to coming into the market. It is felt, however, that sheer necessity will compel heavier buying before many weeks. Contract making is a slow game; many consumers who ordinarily renew promptly seem disposed to play with the open market.

DELAY in contract renewal also is a source of complaint in the Philadelphia market. Although some sizable business was closed up during April, there is still enough tonnage normally under contract that has not been tied up to cause uneasiness among the shippers. In many cases customers have informed the producer that they will look to the open market for supplies during the next month or two.

Traders in Quakertown find an added disappointment in the way production has declined in recent weeks. Heretofore they have felt that the volume of business was some compensation for the unsatisfactory price bases which have prevailed; now they are denied even that slight comfort. Some hope for improvement is held out in the opening of the lake season, but the hope is admittedly small. In fact little betterment is expected until consumers have made a bigger dent in their stockpiles.

In the Baltimore market trading has had the exasperating deliberateness of a game of chess. Purchasing agents continued to buy in relatively small lots for current requirements and paid little or no attention to proposals to build up reserve stocks. Spot prices have been fairly constant because there has been no real incentive to juggle with quotations. Consignment shipments have been held down. Export movement during the month was confined to a small shipment to Porto Rico.

CONTRACT sales of domestic coal in the Birmingham district during April were on a fairly satisfactory basis, as to volume when compared with business a year ago but below the expectations entertained by reason of the fact that retailers entered the new coal year with practically no coal in storage. Bet-

ter grades have been moderately well sold up, but there is plenty of good coal available if a buyer should appear. The situation might have become embarrassing from a production standpoint had it not been for the light demand for steam sizes.

No improvement was registered in industrial movement. Spot inquiry and sales were exceedingly light. Contract shipments continued on practically the same basis as governed March deliveries. The Louisville & Nashville has closed its contract for the new coal year and a number of other roads have bids on their requirements under consideration. In the main industrial contracts have been renewed with little or no change in the tonnage involved. There was no change in the general run of prices.

Anthracite did not move as well as expected in the New York market last month. There were plenty of small orders and retail dealers were kept fairly busy, but consumers were not inclined to fill up their bins for next winter. Naturally under these conditions the mines were not called upon to work full time and there was considerable idleness reported from the mining region.

INLAND trade is reported in much better shape than at tidewater. In fact some of the piers are bothered with distress coal. Several of the producers have announced an increase of 10c. per ton in domestic sizes on May 1, while one of the major interests will make no change until June 1, when prices will go up 25c. Steam coals are in fair shape, largely as a result of curtailed mining.

The outlook for a healthy retail trade in Philadelphia seemed bright last month. Spring prices had been settled; weather conditions favored a steady buy-

ing by the householders. But, unfortunately, the sporadic price cutting of the past winter broke into an open war with some dealers quoting coal \$1.50 below winter prices. It was not until toward the end of the month that this situation seemed to be in a fair way to correction.

There was a fair run of business to the mines because Philadelphia retailers had allowed stocks to dwindle and a number of operations were able to get close to full running time. All steam sizes have been active because the curtailment in production the past month was just about enough to hold steam tonnages offered down to requirements. Buckwheat was in a strong position both because of the shortened supply and because more of this size is being diverted to domestic channels.

SINCE the announcement of spring prices retail dealers at Baltimore have been busy trying to persuade householders to put anthracite into their cellars. Their efforts, however, have met with indifferent success. Many distributors do not believe the consumer will take action until a price advance is imminent. Current retail quotations on the larger sizes range from \$14.75 to \$16.50. These prices are subject to a discount of 50c. for payment within five days after delivery.

Export shipments of coal from the United States during March—the latest month for which current figures are available—were 756,375 gross tons of bituminous coal, 188,531 tons of anthracite and 73,898 tons of coke. The February figures were 796,137 tons of bituminous coal, 223,998 tons of anthracite and 76,216 tons of coke. During March Canada took 620,198 tons of bituminous coal, 187,467 tons of anthracite and 71,170 tons of coke.

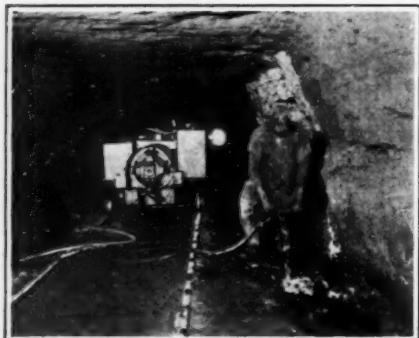
Current Quotations—Spot Prices, Bituminous Coal, Net Tons, F. O. B. Mines

MIDDLE WEST	Market Quoted	Week Ended			
		April 7, 1928	April 14, 1928	April 21, 1928	April 28, 1928
Franklin (Ill.) lump.....	Chicago	\$2.50@\$2.75	\$2.50@\$2.75	\$2.50@\$2.75	\$2.50@\$2.75
Franklin (Ill.) mine-run.....	Chicago	1.90@ 2.40	1.90@ 2.40	1.90@ 2.40	1.90@ 2.40
Franklin (Ill.) screenings.....	Chicago	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90
Central (Ill.) lump.....	Chicago	2.25@ 2.65	2.25@ 2.65	2.25@ 2.65	2.25@ 2.65
Central (Ill.) mine-run.....	Chicago	1.85@ 2.25	1.85@ 2.25	1.85@ 2.25	1.85@ 2.25
Central (Ill.) screenings.....	Chicago	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Ind. 4th Vein lump.....	Chicago	2.00@ 2.75	2.00@ 2.75	2.00@ 2.75	2.00@ 2.75
Ind. 4th Vein mine-run.....	Chicago	1.60@ 2.10	1.60@ 2.10	1.60@ 2.10	1.40@ 2.10
Ind. 4th Vein screenings.....	Chicago	1.60@ 2.00	1.60@ 2.00	1.60@ 2.00	1.40@ 2.00
Ind. 5th Vein lump.....	Chicago	2.00@ 2.75	2.00@ 2.75	2.00@ 2.75	2.00@ 2.75
Ind. 5th Vein mine-run.....	Chicago	1.60@ 2.10	1.60@ 2.10	1.60@ 2.10	1.40@ 2.10
Ind. 5th Vein screenings.....	Chicago	1.60@ 2.00	1.60@ 2.00	1.60@ 2.00	1.40@ 2.00
Mount Olive lump.....	St. Louis	2.50	2.50	2.50	2.50
Mount Olive mine-run.....	St. Louis	2.10@ 2.25	2.10@ 2.25	2.25	2.25
Mount Olive screenings.....	St. Louis	1.50@ 1.60	1.50@ 1.60	1.75	1.75
Standard lump.....	St. Louis	2.35@ 2.50	2.25@ 2.35	2.25@ 2.35	2.25@ 2.35
Standard mine-run.....	St. Louis	1.75@ 1.80	1.75@ 1.80	1.75@ 1.80	1.75@ 1.80
Standard screenings.....	St. Louis	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50
West Ky. block.....	Louisville	1.75@ 1.90	1.75@ 1.90	1.70@ 1.85	1.60@ 1.75
West Ky. mine-run.....	Louisville	1.15@ 1.50	1.15@ 1.50	1.15@ 1.35	1.00@ 1.25
West Ky. screenings.....	Louisville	1.25@ 1.35	1.25@ 1.35	1.25@ 1.35	1.25@ 1.35
West Ky. lump.....	Chicago	1.50@ 1.65	1.50@ 1.65	1.35@ 1.60	1.35@ 1.60
West Ky. mine-run.....	Chicago	1.10@ 1.35	1.10@ 1.35	0.95@ 1.25	0.90@ 1.15
West Ky. screenings.....	Chicago	1.15@ 1.35	1.15@ 1.35	1.05@ 1.15	1.00@ 1.15
SOUTH AND SOUTHWEST					
Big Seam lump.....	Birmingham	\$1.75	\$1.75	\$1.75	\$1.75
Big Seam mine-run.....	Birmingham	1.40@ 1.75	1.40@ 1.75	1.40@ 1.75	1.40@ 1.75
Big Seam (washed).....	Birmingham	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
S. E. Ky. block.....	Chicago	2.00@ 2.75	2.00@ 2.75	2.00@ 2.75	2.00@ 2.75
S. E. Ky. mine-run.....	Chicago	1.35@ 1.75	1.35@ 1.75	1.35@ 1.75	1.35@ 1.75
S. E. Ky. block.....	Louisville	1.85@ 2.25	1.85@ 2.25	1.75@ 2.25	1.75@ 2.25
S. E. Ky. mine-run.....	Louisville	1.35@ 1.65	1.35@ 1.65	1.35@ 1.65	1.35@ 1.65
S. E. Ky. screenings.....	Louisville	0.85@ 1.25	0.85@ 1.25	1.10@ 1.25	1.10@ 1.25
S. E. Ky. block.....	Cincinnati	1.75@ 2.50	1.75@ 2.25	1.75@ 2.50	1.75@ 2.50
S. E. Ky. mine-run.....	Cincinnati	1.25@ 1.75	1.35@ 1.75	1.35@ 1.75	1.25@ 1.75
S. E. Ky. screenings.....	Cincinnati	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25
Kansas shaft lump.....	Kansas City	4.00	4.00	4.00	4.00
Kansas strip lump.....	Kansas City	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75
Kansas mine-run.....	Kansas City	2.50	2.50	2.50	2.50
Kansas screenings.....	Kansas City	3.00@ 3.50	3.00@ 3.50	3.00@ 3.50	3.00@ 3.50

OPERATING IDEAS *from* Production, Electrical and Mechanical Men

Paving Breaker in Mines Lightens Labor

THE digging of drainage ditches along mine roadways is a slow, tedious and back-breaking job if done in the usual way with a pick. Having once been dug, ditches must be cleared of muck. This likewise is an arduous job ordinarily, as the muck packs solidly or accumulates as an oozy mass and in either state offers much resistance to loosening by pick.

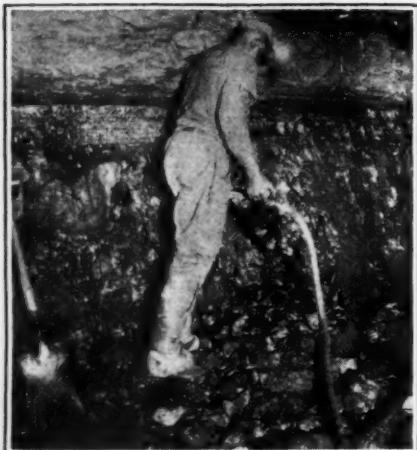


Ditching Made Easy

Recently a pneumatic paving breaker was installed in Mines Nos. 205 and 206 of the Consolidation Coal Co., Jenkins, Ky., for digging and cleaning out ditches. Another use to which the breaker is being put in these mines is for the trimming of ribs where clearance is insufficient. In this service a pick-point bit is used whereas for ditching a chisel-point bit is employed. Both practices save labor.

Of course for the employment of this tool a portable compressor must be available. Since no modern mine is without a portable compressor, these practices may be initiated at small expense.

Trimming a Rib



Automatic Pump Control Timed By Motor-Operated Drum

ELECTRICALLY driven centrifugal pumps equipped with automatic control have so many advantages from the standpoints of economy, safety and reliability that even in anthracite mines few if any cases exist which justify the use of steam pumps. The automatic control is especially important.

Auxiliaries required for automatic control are priming pump, vacuum breaker, vacuum regulator, pressure regulator, float switch, auxiliary control and starter for the main motor. All but the priming pump and vacuum breaker contacts are essentially parts of the electrical control.

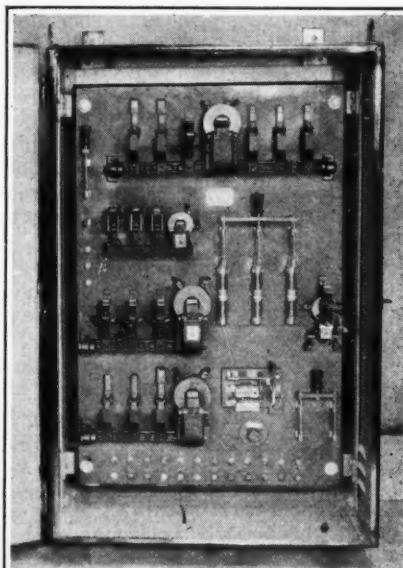
The vacuum regulator is mounted in the intake pipe lines. Its contacts are normally closed and its function is to open the control circuit in case the intake pipe becomes clogged or when too high a vacuum in this section of the line results from any cause.

The pressure regulator is mounted with a connection common to the discharge column. Its contacts are normally open but are adjusted to close when the pressure in the discharge column builds up to a certain value, and to open again should the pressure for any reason fall below this point. This gives protection against burst discharge pipes, which condition otherwise would allow the pump to discharge it into the pump room and mine shafts, causing damage to both pump and electrical equipment and endangering human life.

In the photograph showing an auxiliary control panel in an enclosing cabinet it will be noted that on the control panel are mounted five magnetic relays, one thermal relay and three knife switches. The six-contact relay at the top is energized when the control is in the running position. One contact on this relay acts to start operation of the main motor controller. The other five contacts are used for auxiliary circuits in the control scheme. The second relay from the top energizes the motor

for the timing drum and the third relay energizes the priming pump motor.

The relay in the lower left hand corner is used to lock out the control and prevent restarting of the main pump without priming should the vacuum breaker stick and fail to open its contacts after the apparatus has once gone through a priming sequence.



Auxiliary Control Panel and Cabinet

The single pole relay with interlocking contact shown on the right hand side of the panel energizes a bell alarm circuit in case of overheated bearings or on failure of any other part of the equipment to function properly.

The two-pole and three-pole knife switches open main and control circuits and the single-pole double-throw switch gives automatic control in one position and hand control in the other. The thermal relay protects the primary pump motor in case of an overload.

The motor operated drum is a very important element in the automatic control scheme. It is this drum that determines how many attempts at priming will be made by the equipment before being locked out in case anything is functioning incorrectly. It also determines how long a priming sequence may last.

The sequence of operation of an automatic pumping installation is as follows:

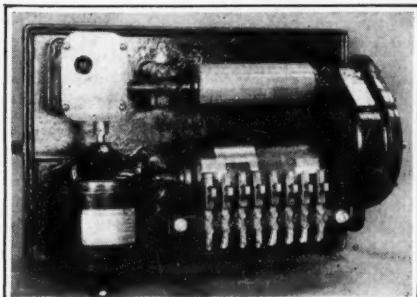
The water in the sump reaches a certain height and the float switch closes, making a circuit to the motor of the timing drum. This drum starts revolving and on traveling a short distance completes a circuit to a relay which on closing energizes the priming pump motor. As the priming pump runs, a vacuum is created, causing the water to rise from the sumps into the pump and vacuum breaker.

The float in the vacuum breaker carries an arm which in turn closes a contact when the water reaches a certain height or when the centrifugal pump is fully primed. When this happens a relay is energized and on closure of its contacts the main pump motor is started. When the main pump starts and the pressure builds up, a holding circuit is completed for the control. At the same time the priming pump motor stops and the vacuum breaker drains. The timing drum continues to revolve until it makes one complete revolution, when it automatically stops itself by breaking its holding circuit.

Failure of the pressure regulator, vacuum breaker or an overheated bearing will shut down the equipment. Sticking of the vacuum breaker or failure of a bearing will prevent restarting and will cause an alarm bell to ring. Should anything go wrong the equipment is locked out and must be reset by an operator before it can start again.

Although electrical equipment has a low maintenance cost and will operate with a minimum amount of attendance, it will not continue indefinitely without some attention. A complete and thorough inspection of all pump auxiliaries and electrical equipment at regular intervals will cost very little in time or money and may prevent an embarrassing delay at some future date.

Motor-Operated Timing Drum



Inside Substations Have Big Advantages

In general, where mine workings are close to the surface, substations are distributed over the property and the direct-current feeders are run through boreholes, airways or abandoned shafts to the load center supplied by each particular station. In some instances underground locations may be preferable and, numerous successful substations are located in the mines, according to M. F. Packard and R. E. Powers, general engineers, Westinghouse Elec-

the station is placed underground and supplied through three-phase high-tension cables.

On account of dampness in the mines it is necessary to use lead-covered cables for 2,200- or 6,600-volt service, and generally it is advisable to go to the expense of steel armor outside of the lead sheath to provide strength and protection against mechanical injury to the cable. For horizontal runs, band-steel armor is entirely satisfactory and is somewhat lower in first cost than wire armor. When cables are run in shafts or boreholes the wire armor is necessary as the cables usually are suspended from the surface in one length and the wire armor provides a good support if used in connection with an efficient clamp. Both ends of the cable must be fitted with pot heads for excluding moisture and to provide suitable terminals for making electrical connections.

Money Talks and Ideas Answer

FOR practical pointers that are published in this section of *Coal Age* \$5 and more will be paid.

Have you a new mining method? Have you had success with some plan for safety? Do you handle haulage problems differently? How about your track work or your shop repair methods.

Send us a short story and either photograph or sketch.

tric & Mfg. Co. Construction costs usually are greater for stations in the workings and they are harder to ventilate as well as to protect from moisture, dust and corrosion.

When the distance from the mine workings to the surface is great it may be found economical to locate the substation inside and install three-phase high-tension cables rather than low-voltage direct-current cables through boreholes to reach the underground equipment. An inside station may be more advantageous also if the country is rough and inaccessible, rendering surface construction difficult and expensive and the substation under such conditions hard to reach for regular inspection.

The cost of transmission lines to the boreholes probably will be about the same in either case, but the drop in direct-current voltage from a surface substation to the inside can be eliminated if the station is located inside. The relative costs of copper positive and negative circuits for the direct-current conductors and three-phase cables, 2,200 or 6,600 volts for alternating-current systems, to transmit the full kilowatt capacity are such as to represent considerable saving in first cost of copper and in distribution loss when

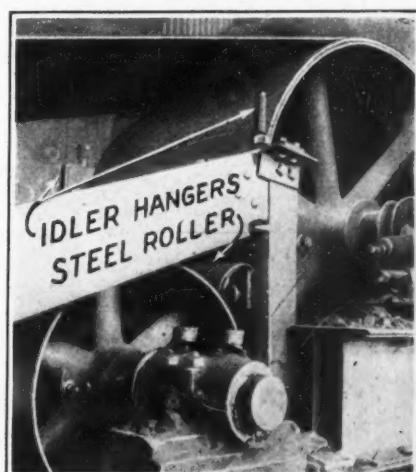
Roller Between Pulleys Stops Belt Reversal

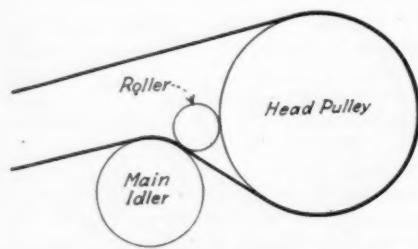
When a 36-in. belt conveyor was installed on the main slope at Western mine of the Norton Coal Mining Co., in Hopkins County, Kentucky, no provision was made to prevent reversal of the belt if the motor was stopped or if for any other reason the driving power failed while the belt was fully loaded.

A. M. Nielsen, division superintendent of the company, hit upon a simple and inexpensive scheme for preventing the reversal. Between the head pulley and main idler in the tipple he installed a steel roller which has a diameter slightly greater than the distance between the faces of these pulleys. Bearings at the ends of the rollers are supported by hanger rods that are free to move up and down and to swing sidewise a slight distance.

When the belt is moving in the normal direction friction against the belt

Showing the End of Roller





Roller Wedged Between Pulleys

tends to hold the roller away from the drive pulley. Reversal of the belt causes the roller to wedge between the pulleys, thus squeezing the belt and stopping it.

Although the device has never failed to hold, Mr. Nielsen suggests that it would be preferable for the roller to be made of paper instead of steel. He thinks this would lessen the chance of the belt slipping by the roller in case the device should be called into play just after starting on a cold morning when the belt is covered with frost.

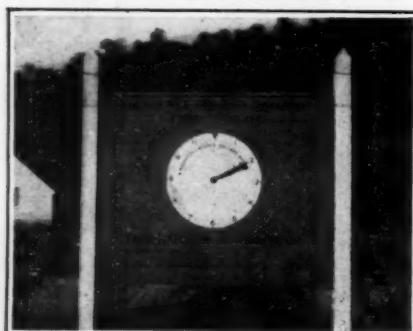
Holds a Stop Watch On Accidents

It appears to be a well-established fact that it is desirable to keep the facts regarding accidents before the eyes of all employees. To accomplish this purpose the clock-dial method is used by the American Rolling Mill Co. The board here illustrated is at the Nellis mine in West Virginia. It is installed beside the walk connecting the office and recreation buildings.

The first of each month the hand is set at the top. Any other position to which it is moved later indicates the number of major accidents to date during that month. One effect of the pointer is a tendency to make each man resolve not to be "No. 3," "No. 4," etc.

About a year and a half ago an intensive safety drive was started. As can be calculated from the tabulation of the major accidents on the board, these have averaged but two per month since the drive began to take effect in July, 1926. This contrasts with an average of 5.4 per month for the first seven months of 1926.

"No Accidents" Stops This Clock

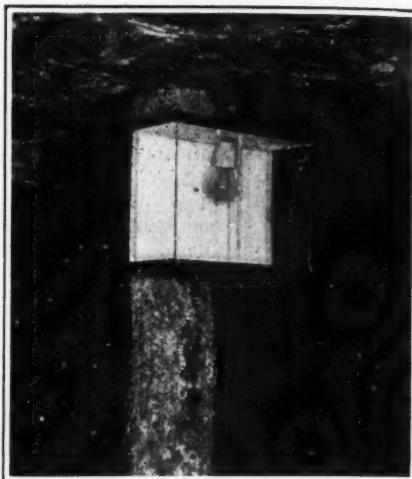


Welded Strap-Iron Horse Has Legion of Uses

There are few shops that do not have frequent use for some form of horse, commonly known as an "old woman," to support work. A simple yet efficient device of this kind, built and used in the Library Shops of the Pittsburgh Coal Co., is shown here.

This "old woman" is built of electrically welded strap and T-iron. Although extremely simple in design, it is rigid and strong. A roller is placed on the top so that the supported work may be slid along as required.

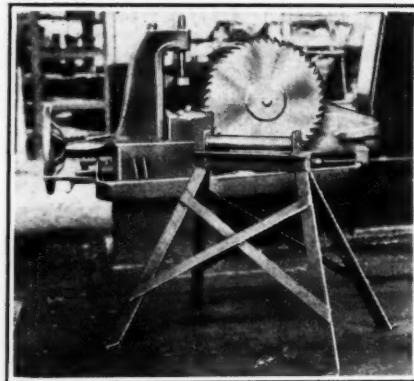
This "old woman" finds a variety of uses in the shop. Just after the accom-



Installed on Posts Beside Track

opened for renewing the lamps by loosening the nut slightly and sliding out one glass. The fact that a wrench is needed to open the box has proved sufficient protection against theft.

Because of the reflecting surfaces in the boxes the lamps are more effective in illuminating the track in each direction than if the lamps were without inclosing cases. The labor cost of making the cases is small because the work is a fill-in job for the carpenter.



An "Old Woman" in Name Only

panying photograph was taken it was turned about and used to support the end of a rod while it was being cut off by the cold saw shown in the background. Of course, such a device can also be used in conjunction with other machines or with an anvil—in fact, the places where it can be employed to advantage are almost unlimited.

Theftproof Case Serves Also as Reflector

Difficulty from theft of lamps led Wm. Ward, superintendent of the Kilsyth and Siltix mines of the McKell Coal & Coke Co., Mount Hope, W. Va., to design and install inclosing cases like that shown in the accompanying photograph taken on the main haulway in the Siltix mine.

The back, top and bottom of the box are of wood, painted white on the inside and black on the outside. The front and ends are of single-strength window glass. The box is 11 in. high, 14 in. long and 6 in. from front to back. There are no posts at the corners to cause shadows in the directions that the light is needed.

Directly in front of the lamp is a bolt which pulls the top and bottom pieces together and clamps the glasses in the grooves provided. The box can be

Limit Switch Test May Damage Equipment

On some types of three-phase loading-boom hoists the limit switch will stop the motor only in case the controller is in the right one of the two operating positions. Because otherwise it makes no difference as to the phase connections to the line, the hoists are sometimes put into use with the wrong connections.

Unless the limit switch is properly tested after installation the hoist may be used indefinitely or until damage is done by an overwind before the wrong connection becomes manifest.

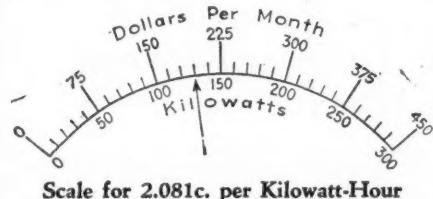
Care should be exercised in making the test to learn if the limit switch will operate properly. At a new installation in the New River field of West Virginia the equipment was damaged during a test of the limit switch. Inasmuch as the motor, hoist, controller and limit switch were received as a unit, the electrician was so certain the limit switch would operate properly that he ran the boom up to the limit. The switch failed to stop the motor and the electrician holding the controller ropes did not act quickly enough after realizing that the switch had failed to function. The trouble was due to wrong phase connection.

In testing a limit switch of any type

it is always well to consider the consequence of a possible failure. The damage when testing the loading-boom hoist would have been averted if the electrician had first tried stopping the motor by using a pole to move the arm of the limit switch while the boom was being raised.

Dollar Meter Suggested As Air Indicator

Supplying sufficient air to all working places to dilute mine gases well below the explosive point is difficult sometimes because the mine foreman is unable to convince the higher officials that money should be spent to clean airways and to repair or renew leaky stoppings.



The condition may get worse and worse, resulting finally in an explosion, the blame for which is placed on the mine foreman because he failed to convince the operator of the danger."

Ray Cobb, superintendent of the North Diamond mine of the West Kentucky Coal Co., Earlington, Ky., then offers the following suggestion: "A possible prevention of mine explosions is to install on the fan motor a meter having the scale calibrated in dollars per month instead of in kilowatts. This would enable the company officials to see at a glance the increased cost of ventilation caused by leaky stoppings and falls in airways.

"With the same or a greater fan speed leaks increase the power required because the fan handles more air. To obtain the same volume of air after falls have restricted airways requires speeding up the fan, with consequent increase in water gage and likewise in power.

If the mine owner or operating official noted that the fan meter was indicating an increased power cost very likely he would give his immediate attention to detecting the cause, and by

so doing would arrive at the conclusion that the airways should be cleaned and better stoppings installed. This would mean better ventilation and less danger of an explosion."

Novel Features in Underground Stable Add to Contentment of Horses

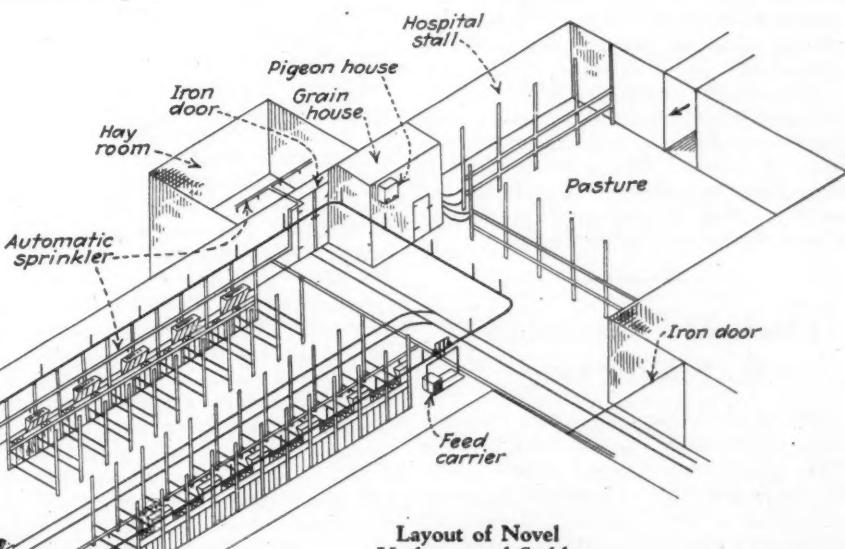
THE underground stable at the Klein (Mont.) mine of the Republic Coal Co. contains some original and novel features, according to W. J. Fene, associate mining engineer, U. S. Bureau of Mines.* The foreman of this mine, Joseph Fletcher, believes that commodious and clean quarters, plenty of food and water, kind treatment and surroundings as nearly as possible like those available on the surface are important factors in the welfare of animals that must be housed continuously underground. With this end in view he has provided comforts and conveniences not usually found in coal-mine stables.

The stable at the Klein mine is approximately 225x35 ft., contains 48 stalls arranged in two rows heading in opposite directions. A wide alleyway runs between the rows at the rear of the stalls, while two narrower passageways separate the heads of the stalls from the rib. The stalls are 6x5 ft., have concrete floors and are separated by chains suspended from 8x8-in. corner posts.

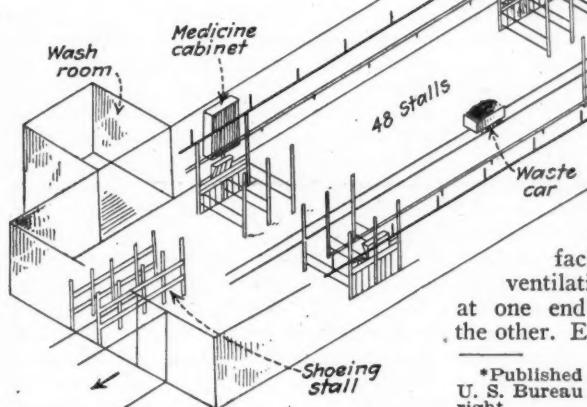
with an iron trough through which running water flows continuously, thus insuring fresh drinking water at all times. Illumination is provided by incandescent electric lamps.

At one end of the stable is a fenced lot, or "pasture," about 60x35 ft. The floor has been covered with fine cinders, and the horses and mules are turned in a few at a time and allowed to roll. There is a commodious hospital stall at one side of the "pasture" for sick or injured animals. A large medicine cabinet containing medicine, bandages and antiseptics is installed near the opposite end of the stable. A room has been provided where the animals may be washed.

As the mine is wet and muddy in many places, the animals working in these sections become dirty, and after a shift are washed off with a hose. Animals are shod in the stable. Although a shoeing stall is provided at one end, it is seldom necessary to put



Layout of Novel Underground Stable



This arrangement of stalls and the absence of partitions greatly facilitates the sweep of the ventilating current, which enters at one end of the stable and leaves the other. Each pair of stalls is provided

animals there for shoeing, as most of them are quite gentle.

Hay is stored in a room adjoining the stable and grain in a shed near the entrance of the hay room. An overhead trolley made of steel rails encircles the stalls. A track is run between the stalls and to the hay room to permit loading out the waste from the stalls and to carry feed into the

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stable. From this trolley a platform is suspended for carrying hay and grain; it can be moved around through the alleyway back of the stalls, an arrangement that permits placing the feed from the rear and obviates going into the stalls.

An important feature of the stable is the method of fire prevention. Realizing the fire hazard that is always present in an underground stable, due to the highly combustible nature of hay, the company has made adequate provisions to combat this hazard. Very little combustible material was used in the construction of the stable. Although this is an open-light mine, no open lights are allowed in the stable. Near the entrance is a shelf on which lamps may be left before men enter, and enough incandescent electric lights are installed to provide ample illumination within. At the entrances to the stable and to the hay room are steel doors which are kept closed with pulleys and weights. An automatic fire-sprinkling system has been installed, with fuse sprinkling plugs over each hay manger and in the hay barn. There is 187 lb. pressure in the water line and the plugs fuse at 185 deg.

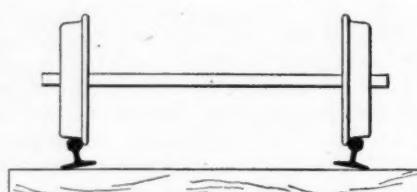
Keeping pigeons in the stable provides the haulage animals with familiar companions. These birds have the liberty of the stable and have become so tame they often perch upon the trolley rail; indeed, several have nearly been run over by the wheels of the feed carrier. Therefore a piece of stiff wire was fastened on each side of the trolley wheels to push the birds off before the wheels reached them, acting like a cowcatcher on a railroad locomotive.

The officials of the Republic Coal Co. are convinced that the humane treatment accorded their animals pays handsome dividends. The use of whips is forbidden, and any act of abuse to the animals that is reported results in severe discipline for the driver.

Track Maintenance Cut By Simple Gage

The all-too-common practice of using mine rails which are too small for the loads they must carry causes many operating problems. However, if care is exercised in maintaining locomotive equipment, the possibilities of reducing track repairs are great. A light-weight rail does not resist strong side pressure because its base is narrow and the spikes are of limited size. Consequently, the side thrust of a locomotive soon causes the rails to become loose and the track becomes irregular.

A more serious and yet unnecessary cause of loose rails is the employment of locomotives having an oversized wheel gage. This condition rarely exists when a locomotive is new, but it may easily



Action of Oversized Wheel Gage



Checks Gage and Flange Thickness

arise when a new or repaired pair of wheels and axles are installed. The wide track gage of the locomotive wheels

causes the flanges to act as a wedge and tilt the rails as shown in one of the accompanying drawings. By employing a wheel gage of the type illustrated, a large anthracite company makes certain that wheel and axle sets of incorrect gage are not used. This tool is so made that when it is set on the tread of a pair of wheels it quickly indicates whether or not the gage is correct. An additional advantage of the instrument is that the end parts, which fit upon the wheels, can be accurately made to determine if the machine work on the tread and flange is satisfactory. It is possible for the wheels to be properly positioned on an axle and yet not match the track gage. This condition arises when the thickness of the wheel flange is incorrect.

When Fan Motors Stop They Are Restarted Automatically at Time Intervals

The bituminous coal mines in the southern part of Alberta and southeastern British Columbia, like the majority of coal mines, are extremely gaseous and special precautions are necessary therefore both in respect to the installation of equipment underground and the ventilation of the properties, according to R. S. Trowsdale, Canadian General Electric Co., Calgary, Alberta.

In the deeper mines in southeastern British Columbia the matter of ventilation is extremely important, and the mine regulations applying thereto are most stringent, with the result that companies pay special attention to this matter and all devices that will insure the most certain operation of the fans.

Some time ago the Crow's Nest Pass Coal Co., operating mines at Coal Creek, near Fernie and Michel, decided to purchase a limited amount of power from the East Kootenay Power Co. for operating its mine fans. The power company at that time was operating a new plant and its two new transmission lines extended through a country that was mountainous and subject to both wind and electric storms. The natural result was that there were some interruptions to the power supply. These would have the effect of shutting down the electrically operated mine fans, which are placed in inaccessible spots. Were it necessary to restart them manually, considerable time would elapse before the attendant could reach the control house and restart the fan. The mine regulations and the gaseous conditions in some of these mines are such that, if ventilation stops for from four to five minutes, it is necessary to withdraw the men from the mine and the day's operations cease.

After trying out the first unit of 300 hp. the company decided to electrify two more fans, and at that time a

scheme was worked out whereby, in the event of voltage failure, the fan motors would shut down and, upon return of voltage to the line, they would automatically start up again. This in itself was not sufficient, as it was felt that the throwing of several large motors on the line at one time would draw such starting current that it might open the primary protection to the high-tension transformer bank or interfere with line regulation to such an extent that it would affect other properties and services. Therefore a scheme was developed whereby the largest fan would start up and, after a predetermined time, the second and third fans would start.

This was brought about by making all the starting equipment automatic, using automatic compensators for the standard squirrel-cage motors and an oil-immersed magnetic starter for the high-torque, high-reactance, squirrel-cage motors. Definite-time relays were used to govern the starting of the second and third motors at the proper time.

In order that a single attendant could, from an advantageous position, note the operation of the various fans and stop and start them at will, a central control house was established convenient to the three ventilating points and in this house was installed a small panel on which are mounted an ammeter for each circuit, lever-type control switches and snap switches for the operation of the control circuits. The object of the ammeter is to permit the attendant to determine whether the fans are running or not and to detect the breaking of a belt or other unusual occurrence.

At each fan there also were installed "start" and "stop" push-button stations each equipped with a locking device so that the attendant making his round of inspection could start and stop the motors at will when in the fan houses.